COAL AGE

McGRAW-HILL COMPANY, INC.
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Devoted to the Operating, Technical and Business Problems of the Coal-Mining Industry

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Engineering Editor

Volume 25 | NEW YORK, MAY 8, 1924 | Number 19

Why?

MANY coal companies are at their wit's end to keep from bankruptcy at present prices. Others neighboring to these are producing coal from similar seams at prices 50c., or more, lower. Some say the difference is nearer $1. There are two reasons—one is that the distressed companies are too poor to buy the necessary machinery and the other is that they are too conservative to fall into line with progress. Either reason is a heavy indictment of the coal industry.

A number of companies will attempt this year to get among the low-cost producers. If they will not or cannot they would do well to commit suicide according to forms provided by law. They merely prolong their agony by refusing to use the means of rejuvenation which other companies have adopted.

Too Much Mine

TOO many mines is hardly worse than "too much mine." Most of the slackness in supervision, most of the idleness of day hands, most of the aimlessness in operation, most of the irregularity of mine-car service is chargeable, and indeed is frequently charged, to the hopelessness of co-ordinating the activities of a big mine with only a small output over which to spread the supervisory costs. Fortunately every mechanical advance makes concentration of operation more possible. Let every effort be made to work intensively, to shorten up roadways, to reduce the length of airways, to decrease the mileage of track, of trolley wires, of timbered roads and other expensive items.

It is better to save the costs of track, power, trolley and pipe lines, pumps and timber and put this money into mining, loading and conveying machinery. Men have been described as "land poor" and in a similar sense coal companies may be said to be "mine poor" and "entry poor." A rambling mine like a rambling manorial mansion is costly to maintain. Close up your many storied, multi-corridored residence and live in a cottage with but one floor and few rooms. With adequate facilities you will get just as much coal from the smaller mine.

Can the Union Fields Compete?

FORTUNATELY for the union fields of the bituminous industry, the non-union fields cannot supply the whole market any more than the big anthracite concerns can supply the entire demand for hard coal. As a result of this inability of the large anthracite firms to provide at times all the anthracite needed, the independents are able frequently to sell at a higher price than is set by the larger anthracite firms. The anthracite business is, therefore, in a degree non-competitive.

In a similar way the union fields will not in a certain sense have to compete with the non-union, for the latter fields cannot supply all the coal needed. There are too many restricting conditions. The railroads in most non-union regions are already grievously overloaded. New and better equipment will help, especially electrification, but, nevertheless, the railroads will be unable to afford the necessary service. Then again, men will be scarce at the coal mines. The restrictions of immigration lay a heavy hand on advancing coal territory and press far less heavily on coal fields that are declining. Mines in union territory are usually so circumstanced that they can draw from other industries if they need the men, whereas those in non-union fields can do so only by colonization, and the men colonized who cannot revisit their friends and who find the scenery different and urban conditions lacking are liable to be discontented. Furthermore, freight rates which favor non-union fields in certain directions hamper them in others, often not in proportion to the distance to the market, but enough to give the union in its own natural field, an advantage partly counterbalancing the greater cost of production.

So there will still be some hope, not much perhaps, for union fields; and those mines that distance others in efficient low-cost production may get such a generous measure of the business available to union mines as to remove them from the list of the impoverished and complaining. In fact, the bad roof in some non-union mines will make complete modernization slow and difficult, and the advance of the industry may make it questionable whether they, despite their low wage scales, can compete in a market dominated by machine-loaded coal, union and non-union.

New Problems in Merchandising

A FEW years ago the temperatures in furnaces were low and coal was sold on the number of British thermal units. Even that quantity was seldom determined. Then suddenly we heard about the fusing temperatures of ash. It is not so long ago that the president of a bituminous mining institute and a leading operating man, learned for the first time that the ash of the coal he was producing and marketing had an unusually high fusing point. He had never realized before that he had in that fact a favoring condition. He doubtless realizes it now.

At first the reactions to this unknown variable were somewhat strange and even today they are not marked by any proper comprehension. Companies producing coal with varying fusing points desired to operate their mines incognito, so to speak, so that they could supply their customers from any mine they preferred. They did not agree to send the coal from any specific mine or any given bed. Where all the mines of any company

produced coal from the same bed the effect was not particularly detrimental. A little more or a little less impurity is not so distressing as a greater or lesser fusibility of the ash.

Where, however, this latter quality is important by reason of the type of stokers employed and the customary over-rating of the boilers it was suicidal to ship coal from a mine the ash of which had a low fusing temperature to a customer who had a high-temperature furnace and a stoker ill-suited for handling clinker.

It is still customary, we are informed, in the anthracite region for large companies to sell their steam sizes without agreement to ship from any one mine or any certain groups of mines. It is still the plan to mix, in the breakers, coal from different seams, mines and culm banks. Perhaps these practices are justified, but the small company with a favorable fusing point and but one mine has sometimes a considerable advantage. It gets to be known as the producer of steam sizes not likely to give trouble when the fires are forced.

The problem of the mixing of coals and the selling of the output from all the mines of a company without discrimination is one that is worthy of consideration. It may pay to say that Buckwheat No. 3 is just that and nothing more or it may pay to say it comes from seams or mines that produce a coal having an ash which does not fuse at a low temperature. This introduces complications in producing, cleaning, storing and selling, and complications in these departments in themselves are not desirable. They militate against economy in producing and handling but perhaps they might help in marketing.

This suggestion is given in the hope that it may receive consideration. The validity of the proposal depends on the character of the product of the mine. Some companies may be able to produce and sell their output without any discrimination other than that of size, but others may do well to segregate the product and place it where it will do the best work.

Larger Coal

MINERS, now that their compensation is based on the quantity of mine-run coal produced, shoot it without mercy or judgment, with the result that much of it is merely stoker fuel. Some operators are trying to instruct and coax their men into adopting better methods, but the effort, though commendable, is not productive of good results. Even the present low prices and poor market do not make the miners realize that on the quality of their product depends the ability of their employer to provide them with work.

The article by Charles H. Thompson in the "Problems in Underground Management" section of this issue calls attention to one way in which the problem may be met, not so much by intention as incidentally. In a truly mechanically operated mine the operations at the face fall into the hands of three classes of operatives—the mining-machine men, the men who drill and shoot down the coal and the machine loaders.

It is not feasible to give any two of these jobs to the same crew. Consequently, those who drill and shoot holes for mechanical loading will be so few that it will be possible to select and train these men to such a degree that large coal will be obtained. They will drill a sufficient number of light shots to break up the coal into sizes large enough to be saleable and small enough to be readily handled, at the same time leaving the impurities in the coal in sizes large enough to be extracted readily at the picking table and leaving the roof unshattered by excessive, improperly placed shots. Given machine drills this part of the work can be performed with minimum labor and yet with such effectiveness as to achieve the best results. Shot drillers also who are well trained and well equipped, can be relied on to shoot the coal in such manner that coal-dust explosions are less to be feared.

Accordingly, without design, the mechanical loader may help to solve four of our most difficult problems—fine coal, excessive ash, bad roof and dust explosions.

Walking Around the Block

THOSE who criticize the inefficiency of mine operations frequently draw their conclusions from some particular instance of waste which has come under their observation, but like all opinion based on superficial surveys, their judgment is often erratic.

However, any engineer, even one unfamiliar with mining conditions, upon entering almost any mine could quickly and accurately come to the conclusion that the direct-current power losses are unusually great. But he would make a grievous error if he decided without inquiry that the electrical engineer did not know his business.

Company organizations and the laws in many states are such that supervision of all inside mine equipment, after being placed in service, is directly under the mine foreman. In most cases, as it rightly should be, the first duty of the mine foreman is to get out coal. This he does, but unfortunately those men who have been placed on his pay roll to maintain the track system, to repair feeders and to install rail bonds are too frequently taken away from their regular work to "push the coal." Consequently, the power-distributing system of the mine soon becomes so bad that flagrant wastes of power become apparent. Whenever a locomotive passes, the leaky and corroded insulators, grounded feeder circuits and sparking rail joints remind us of an old-fashioned Fourth of July celebration.

Most every mine electrical engineer has had a keen realization of these conditions and has tried many plans which he thought might possibly correct the evils. Not much success has been attained because, although the work is strictly an electrical matter, he must deal with it indirectly through the mine foreman.

Now, some resourceful electrical men are getting around this obstacle by considering the repair of the feeder and return circuits adjacent to any new electrical installation a part of their work. Others are moving the power-converting equipment into the mines where it will be near the load center. Thus the feeder and return circuits are repaired or changed and given a new lease on life and are at least temporarily shortened so greatly that the power losses are largely reduced.

A NEW MACHINE enables strip-mine men to cut coal like ice. Now where's the machine that will enable them to sell it like ice, in hot weather.

WELL, ANYWAY, neither the G.O.P. steamroller nor the Democratic undercutter is a coal burner. There are other fuels.

Stone Dusting by Compressed Air

Stone Dusting:

A Means of Safety Which Helps Britain to Keep Fatality Rate One-Third as Large as Ours

Stone Dusting Is a Legal Requirement—Floors, Ribs and Roof Alike Must Be Treated—Stone-Dust Zones and Barriers Not Considered Effective Alone—Methods Employed in Dusting

By J. A. S. Ritson

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Soon after the erection in 1908 of an experiment station at Altofts, England, at the expense of the Mining Association of Great Britain, two facts were thoroughly demonstrated. These were: That coal dust might form an explosive mixture with air, and that fine stone dust acts as a barrier to the spread or propagation of a coal-dust explosion.

It had long been known that the fine coal scattered along haulage roads and elsewhere throughout the mines often became ignited during a gas explosion, and it was believed that it constituted a certain factor contributing to both the propagation and violence of such explosions. The experiments at Altofts, and later those conducted at the Government Station at Eskmeals, furnished data for the 1914 report of the Explosions in Mines Committee. This report stated substantially: That (1) the maintenance throughout the haulageways of such a proportion of incombustible dust in a finely divided state as would, with the coal dust present, form a mixture containing at least 50 per cent of ash, or (2) the maintenance of at least 30 per cent of water intimately mixed with the dust along the road, or (3) a combination of these methods would prove highly effective in diminishing the force of an explosion, if not even entirely preventing its spread.

Section 62 of the Coal Mines Act of 1911 provides that: In every mine where the roof, ribs and floor are not naturally wet, (1) coal dust so far as possible must be prevented from entering the downcast shaft. In new installations, the preparation screens must be kept at least 240 ft. from the air intake. (2) Cars must be built and maintained as nearly dust-tight as possible. (3) Roads must be systematically cleaned and accumulations of coal dust prevented. (4) Systematic measures must be taken to prevent the initiation of explosions and their propagation along roads. (5) Roads

Note—In the headpiece a man is shown introducing stone dust into the ventilating current by means of an injector operated from the power air line. This injector much resembles the device employed for handling water. It sucks the dust from the mine car and discharges it in a cloud. This is taken up by the ventilating current and deposited on all surfaces of the heading.

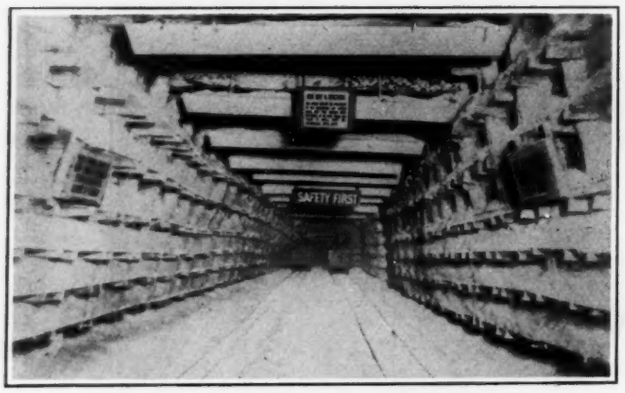


Fig. 1—A Dust Barrier or Barrage

Shelves are placed along the sides of the heading as well as troughs extending across this passage just under the roof. Such barriers are often placed at the entrance to each section of the mine.

must be examined daily by a competent official who shall report the result of such examinations in a book kept at the mine for that purpose.

The "Explosives in Coal Mines Order" forbids the use of any but "permitted explosives" in mines that are dry and dusty. Furthermore, a shot may be fired only when adequate precautions have been taken to deal with any inflammable gas or coal dust that may be present.

All Sides of Road Must Be Treated

The General Regulations of July 30, 1920, in enumerating the precautions to be taken against coal dust specified:

(1) The floor, roof and sides of every road or part of a road that is accessible must be treated with incombustible dust in such a manner and at such intervals as will insure that the dust on the floor, roof and sides throughout shall always consist of a mixture containing less than 50 per cent of combustible matter. Water added to the coal dust or naturally present may be reckoned as so much incombustible.

(2) Incombustible dust used for this purpose shall contain not less than 50 per cent by weight of material capable when dry of passing a sieve with 200 meshes to the linear inch. If a larger proportion of incombustible dust is employed, however, the percentage of material of this fineness may be decreased, but must never fall below 25 per cent.

(3) The incombustible dust used must not be injurious to the health of those working in the mines.

(4) The term road as here used includes all roads from the shaft or portal to within 30 ft. of the working face.

(5) Representative samples of the mine dust must be taken by the management at least once each month and the result of the analysis posted at the mine mouth.

(6) Methods to be followed in taking and analyzing samples are legally prescribed.

These, briefly, are the chief legal requirements governing stone dusting in the mines of Great Britain. One important detail worthy of particular notice is that "floor, roof and sides" must be treated with equal care. It is not sufficient to treat merely the floor.

Stone dust is used in three ways in British mines: (a) A 50 per cent or greater mixture of incombustible matter is maintained throughout the roadways of the mine, (b) stone-dust zones to extinguish a mine explosion and prevent its propagation are provided, and (c) stone-dust barriers or barrages are installed. Legal requirements demand that the first method shall be adopted, and as a result, it is the only one extensively employed. In many mines, however, either the second or third method of employing stone dust is used in addition to the first, because it is recognized that the first means does not or may not secure complete immunity.

Research has shown that under certain conditions an explosion can be propagated through a "50/50 mixture," but that it is difficult to initiate an explosion in dust containing 50 per cent of incombustible matter. "Incombustible dust is more effective in preventing the ignition of coal dust than in checking an inflammation that has started."

Methods *b* and *c* mentioned above do not prevent the initiation of an explosion, but will stop its spread through the mines. Throughout Great Britain the belief is general that it is wiser to prevent the initiation of an explosion than to rely on stopping one after it has started. Consequently, an attempt is made to keep 50 per cent or more of incombustible dust on all roads.

It is realized that the two chief causes of colliery explosions are defective safety lamps and shotfiring. As a result every effort is being made to improve the safety and illuminating power of the inclosed-flame lamp and to regulate shotfiring in dangerous mines until (if ever) a safe mine explosive shall be produced. Electric hand lamps are being more extensively used each year, but until a satisfactory device for gas testing, other than a flame safety lamp is produced, this latter device must continue to be used. The ancient proverb running to the effect that "prevention is better than cure" underlies present-day British practice.

Dusting Improves Illumination of Mine

One of the results secured from the first method of stone dusting has been improved illumination of the roadways. The light-colored stone dust adheres to the sides and roof of the road and naturally reflects more light than the somber coal and roof rock. It is hoped that this may alleviate nystagmus. It has been shown by Llewellyn that the increase in illumination afforded by rock dusting varies from 100 to 400 per cent, the untreated surface reflecting 10 per cent, and the treated surface up to 55 per cent of the incident light.

The conditions which cause coal dust to be formed in the mines of Great Britain differ largely from those which cause the presence of coal dust in the mines of the United States. British mines are, as a rule, deeper than American and for the most part are worked by longwall methods. Consequently, the floor creeps and the tracks are uneven. As a result, more coal is spilled in British mines than in American during the journey from the face to the shaft bottom. Where the roof is bad, a single track is maintained and fast main-and-tail-rope haulage is employed. The speed varies from 4 to 10 miles per hour. When a full trip is coming out at, say, 8 miles per hour on the intake airway, much small coal is blown off the tops of the cars, settling on the floor, roof and sides.

The cars used in English mines are usually small and are frequently loaded well above the top of the sideboards. Attempts have been made to render these cars dust-tight, but in practice this is rarely attained. The quantity of fine dust actually produced varies between wide limits in different localities, so that whereas 2 lb. of stone dust per ton of coal hoisted is sufficient to maintain a 50/50 mixture in one district, in another it might require 10 to 12 lb.

Again, English mines are not subject to as wide variations in temperature between winter and summer as are American operations. Consequently, although the ventilating current during the winter months renders the mines drier than in summer, the difference is not as pronounced as in America. As a result, the coal dust in American mines is drier, particularly during the winter, than it is in Great Britain.

Various dusts are being employed for mixing with the coal, but Fuller's earth, shale and limestone are the more common. The Seventh Report of the Explosions in Mines Committee runs in part as follows: "Shale dust may be used with safety and powdered clay or chalk (free from flint or grit) is also practically harmless. On the other hand, there are two varieties of dust, the use of which may be injurious to health, namely, (a) dust from such rocks as ganister or sandstone that contains a large proportion of free crystalline silica which forms fine sharp-edged particles, and (b) dust of a gritty nature, such as powdered slag, clinker, flue dust and the like, which, while possibly not injurious to the lungs when mixed with coal dust, may irritate severely the eyes and throat and predispose those who breathe it to bronchial ailments."

Fineness of Stone Dust Highly Important

Leaving aside the considerations of health, however, this committee stated that: "The fineness of incombustible dust rather than its chemical composition affords a measure of its probable effectiveness in preventing the ignition of coal dust with which it may be mixed." Haldane has stated that "his investigations showed the dust of argillaceous shale, such as is found inter-stratified in the coal measures in most mines of the United Kingdom and which is being extensively used for coal dusting, although it contains silica, is not liable to prove a danger to health."

It is the general practice for colliery companies to install crushing machinery at the mines and pulverize coal shale to the necessary fineness for use underground. Some, however, still buy Fuller's earth or ground limestone considering it more suitable because it contains no silica.

One decided advantage possessed by limestone dust is that carbon dioxide is liberated from it by the temperature of an explosion, thus assisting in quenching the flame. In some regions, instead of crushing the rock at the individual mine, a central plant has been erected where the material is pulverized and delivered to several

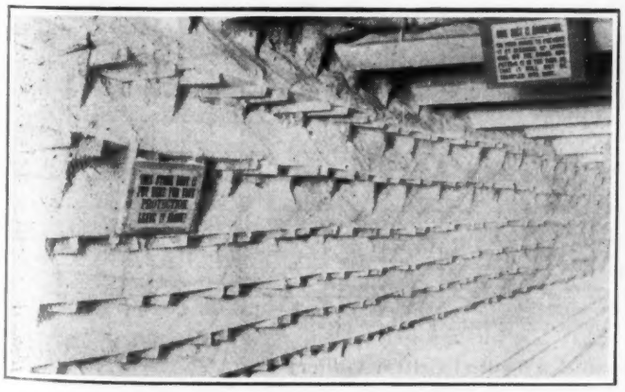


Fig. 2—Side View of a Dust Barrier

Although many dust barriers are employed in British mines they are considered as aids to explosion prevention only, chief reliance being placed on the stone dust deposited on main roads.

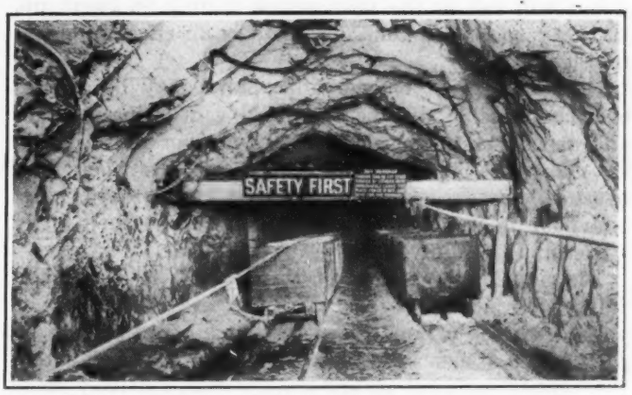


Fig. 3—Improved Lighting Due to Stone Dusting

White dust made by pulverizing worn-out plaster of Paris molds from potteries, is blown into the ventilating current by air pressure. This is deposited upon all the roadway surfaces and whitens them.

collieries. The choice between these systems is a purely financial consideration.

In its Sixth Report, the Explosions in Mines Committee states that: "Any incombustible dust used to raise artificially the ash content of the dust on roadways should be composed so far as possible of particles capable of passing through the gauze of a safety lamp (28 S.W.G. or 784 meshes to the square inch). Shale, limestone and other dusts that have been ground so fine as to pass through a safety lamp gauze normally contain a large proportion of much finer particles, the inclusion of which is important. Experiments have shown that unless there is present approximately 50 per cent by weight of particles capable of passing through a 200x200 sieve, more than one part of incombustible dust to one part of coal dust is required to prevent the ignition of a coal-dust mixture produced by a cannon shot."

It follows, therefore, that the incombustible dust used to mix with fine coal must all pass through a 28-mesh sieve, and at least 50 per cent of it must be capable of passing a 200-mesh sieve if a 50/50 mixture is required. If less than 50 per cent passes a 200-mesh sieve, the proportion of incombustible to combustible matter must exceed 50 per cent, but that portion passing a 200-mesh sieve must in no case fall below 25 per cent.

This size of dust is obtained by grinding the materials in mills of various kinds, but usually those of the impact type. Many different varieties of pulverizing machines are on the market, such as the impact, ball, tube, pestle-and-mortar, etc. Their capacity varies from 100 lb. to 3 long tons per hour, and the horsepower required ranges from 1 to 50, depending on the quantity of material and the percentage of dust that must pass a 200-mesh sieve.

Three Methods of Dust Distribution Are Used

In general rock dust is distributed in English mines by means of three distinct methods—hand, the ventilating current or mechanical means. In the hand method, the dust sent into the mine in bags or cars, is carried by a workman who travels with the ventilating current and throws it either with his hands or by means of a small shovel onto the sides and floor of the road. Comparatively coarse dust is thrown with considerable force so as to dislodge any fine coal with which it may come in contact. The object sought is to fill all crevices and cover all ledges with stone dust lying at its natural angle of repose, so that coal dust may not lodge upon

it but will fall to the floor where it may be swept up. In this respect the stone dust acts as an effective cleaning agent.

Fine stone dust on the other hand may be carried over appreciable distances by the ventilating current and deposited on the sides, roof and floor of the road. In many districts the shotfirers are provided with brushes. Before shooting, they sweep the roof, sides and floor to remove the fine coal dust and then apply a dressing of stone dust.

Distribution by means of the ventilating current is fairly satisfactory if the velocity of air is high. It is open to the objection, however, that a large proportion of the dust is deposited near the point where it enters the ventilating current and only a comparatively small quantity is carried an appreciable distance. According to Lovatt, a test at Birchenwood showed that 124.7 gr. of dust were deposited per square foot per hour at a distance of 60 ft. from the distributing station, whereas only 1.584 gr. were deposited at 360 ft. A larger proportion was deposited on the roof and sides at the greater distance than at the shorter.

Various methods are employed in introducing rock dust into the air current. One of these is to take advantage of the high velocities of air passing through regulators. This is satisfactory if the velocity is high enough. Only a small quantity of dust at any one time is introduced into the air current and the operation repeated until the required quantity of dust has been applied. In some instances as much as 200 lb. or more can be distributed in this manner in five minutes.

Another expedient is to place small trapdoors in the main separation doors. These trapdoors are opened and dust introduced into the air current as previously described. Still another method is to employ pipes through overcasts. The dust is introduced into these pipes and is sucked into the return airway and thus distributed.

Distribution by mechanical means is one of the most common forms of spreading stone dust throughout the mines. It is, however, open to an objection that is common to all schemes which employ the ventilating current as a carrier of the dust, namely, that a large percentage of the dust is deposited near the distributing point. If, however, the dust is very fine and dry and the air current moves at a high velocity, the dust may be carried for considerable distances. Thus in South Wales instances are recorded where distinct traces of stone dust were detected 3,000 ft. from the injector. Under such circumstances as these, the stone dust is distributed in a manner quite similar to that which distributes the coal dust.

Unless the dust is extremely fine, this method is applicable only in roads less than 7 ft. square, as the velocity of the air current in larger passages would be insufficient to carry even the finest particles to any appreciable distance. As the quantity of fine dust is comparatively small in any case, it follows that the area from 150 to 300 ft. from the injector will receive an excess of the dusting material, although traces of it may be carried for as much as 1,000 yd. The quantity

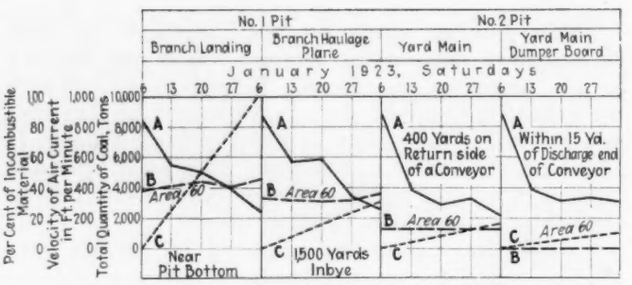


Fig. 5—Coal-Dust Deposition in Various Districts of a Typical Colliery

Weekly observations are recorded in this instance. The graphs for each district show a marked similarity to the analogous graphs for the others. Graph *A* shows the percentage of incombustible material, graph *B* the velocity of the air current in feet per minute and graph *C* the total quantity of coal in tons.

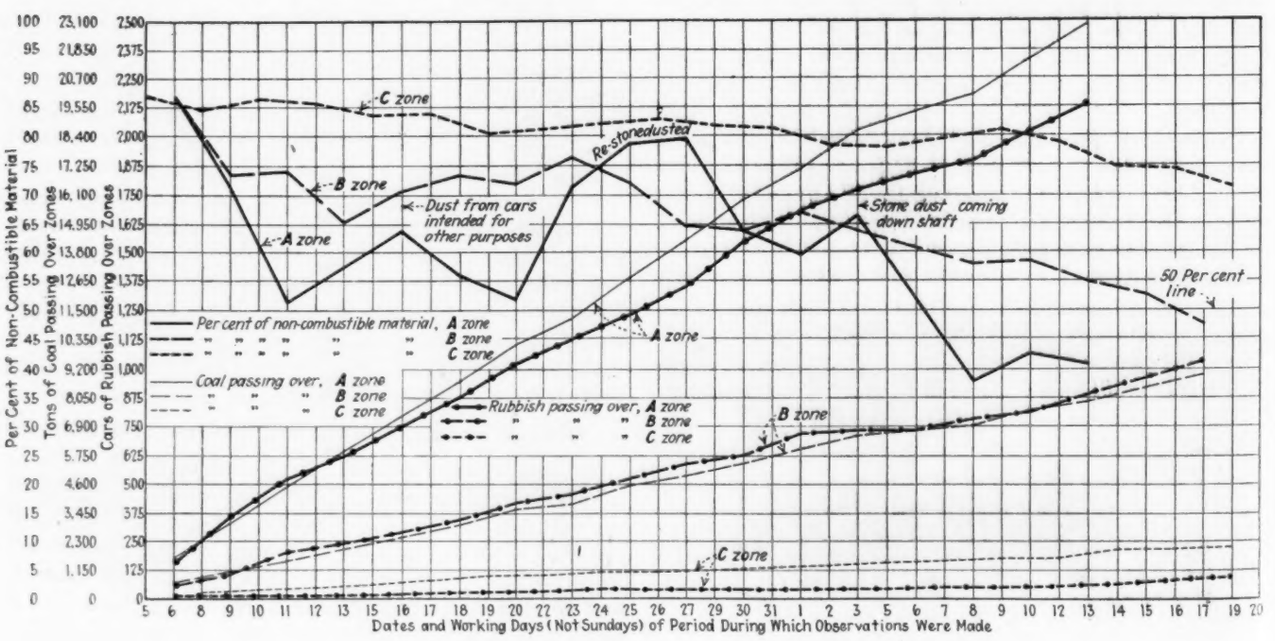


Fig. 4—Rate of Coal-Dust Deposition at a Typical British Colliery

Graphs show the result of day-to-day records and analyses on three typical mine passageways. A stone crusher is located within a few yards of the downcast shaft. This accounts for the sudden upward bend at one point in the graph for Zone *A*, much stone dust having fallen down the shaft and increased the percentage of incombustible dust on roof, sides and floor. Many trains of stone dust were taken over the three zones between tests, the greatest number passing over Zone *A*. The velocity of the air on Zone *C* is only 100 ft. per minute, which is too slow to carry stone dust for any great distance.

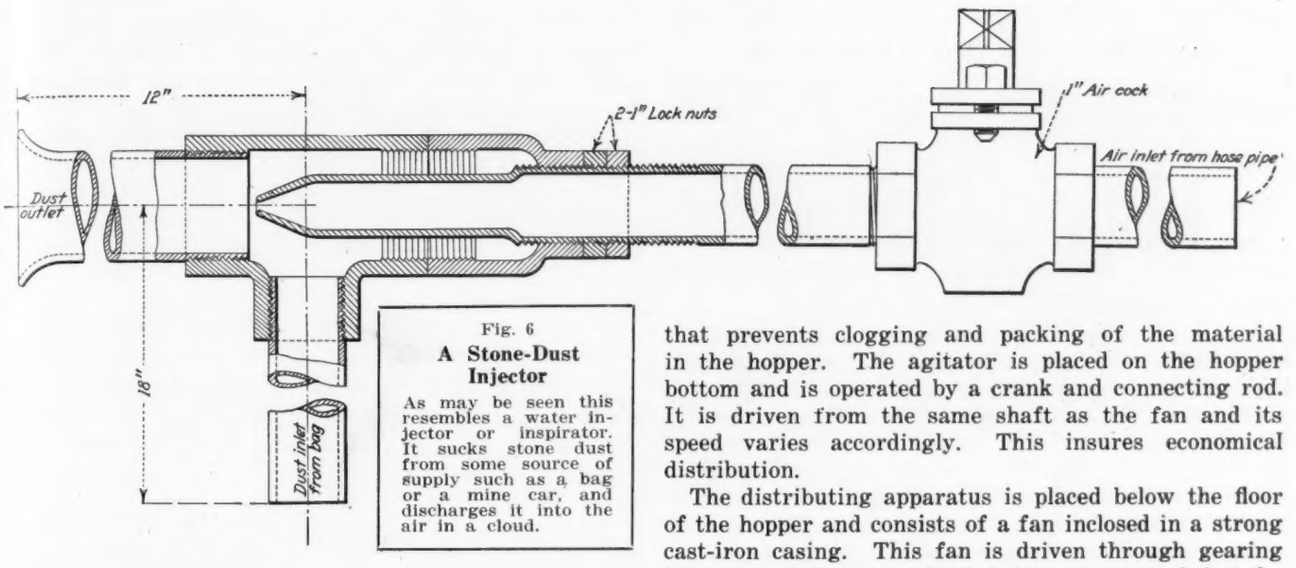


Fig. 6
A Stone-Dust Injector
As may be seen this resembles a water injector or inspirator. It sucks stone dust from some source of supply such as a bag or a mine car, and discharges it into the air in a cloud.

deposited at such distances as this, however, is too small to be of any value.

The common form of fixed distribution apparatus consists of a hopper placed at the side of the road and filled with stone dust. In its bottom is a compressed-air injector which, when the air pressure is turned on, forces a stream of air and stone dust into the ventilating current, which carries and deposits the dust along the road. In order that this method may be of greatest efficiency, it is first necessary to remove the coal dust from the road. No satisfactory mechanical means have yet been found for performing this operation.

In South Wales compressed air has been employed to blow the coal dust from the roof and ribs. A series of fine water sprays collect the combustible dust thus dislodged. Although a large proportion of the dust was caught and brought down by these sprays, to be shoveled up later, much of the finer and consequently more dangerous particles passed through them to be deposited further inbye. Until a satisfactory means for collecting coal dust from the roadways has been devised, it is questionable if any type of stone-dusting appliance depending on the carrying power of the ventilating current will be effective. Before stone dusting is applied, the roads should be cleaned, but this frequently means only that the finer coal dust is stirred up to settle somewhere else.

Injector Blows Dust into Ventilating Current

Recognizing the fact that the ventilating current forms an effective dust-carrying medium for distances less than 100 yd., an adaptation of the injector apparatus above described consists in placing distributing stations every 50 to 100 yd. Into the hoppers of these stations a bag of stone dust is poured and distributed into the air current by an injector. Another adaptation is to mount the whole apparatus on a car, which, being capable of ready transportation from place to place, is fairly satisfactory.

Yet another device which is extremely useful, particularly in mines where compressed air is not employed, is a dust distributor wherein a small fan driven from the wheels of a car forces a cloud of dust through a suitable nozzle. Probably the best known machine of this type is the Oldham stone duster. In this device the dust is carried in a steel hopper in the bottom of which is a reciprocating agitator fitted with a dust web that prevents clogging and packing of the material in the hopper. The agitator is placed on the hopper bottom and is operated by a crank and connecting rod. It is driven from the same shaft as the fan and its speed varies accordingly. This insures economical distribution.

The distributing apparatus is placed below the floor of the hopper and consists of a fan inclosed in a strong cast-iron casing. This fan is driven through gearing from the wheel hub, a clutch being so arranged that the driving mechanism may be thrown into or out of gear at will.

Dust Distributed into Roadway by Fan Blast

A dust-regulating valve is fitted to the bottom of the hopper and as the agitated dust emerges it is caught by the fan blast and distributed all over the roadway. The car may be drawn along by a pony or by mechanical means.

Table I shows the results of a test conducted with this apparatus when operating under the following conditions: The average height of the road way was 5 ft. 6 in., and its width 11 ft. The velocity of the air current was 7 ft. per second, or 420 ft. per min. The length of roadway tested was 1,200 ft.

Samples of the dust were taken from the roadway every 150 ft., as follows: First set, eight samples before dusting; second set, eight samples after the machine had made two trips, both in an outbye direction; third set, eight samples taken after the machine had made two more trips, one inbye and one outbye; fourth set, eight samples taken after the machine had made a further trip inbye. The results of the analyses set

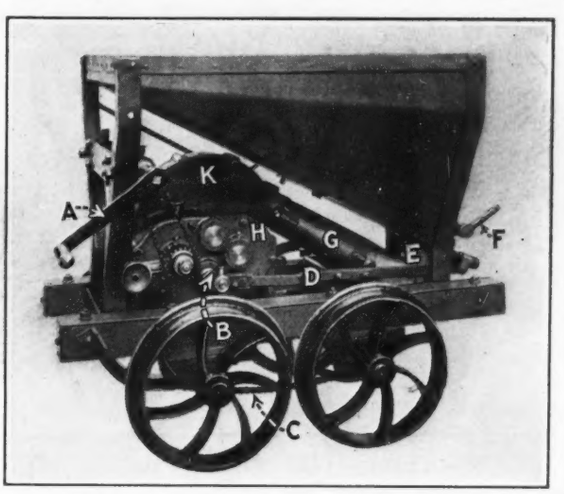


Fig. 7—The Oldham Stone Duster
This dust car may be operated either by hand or by power from the wheels. *A* is the lever or crank for hand operation, *B* the agitator crank, *C* the chain drive from the wheels, *D* the agitator connecting rod, *E* the nozzle pipe, *F* the dust control, *G* the distrance piece or air delivery pipe, *H* the gear casing, and *K* the fan casing.

Table I—Summary of Tests on Stone Dusting

No. of Trips of Stone Duster Along Road	Total Average Combustible Matter Present Per Cent	Total Average Reduction in Combustible Matter Present Per Cent
0	58.3	....
2	46.3	12
4	35.7	22.6
5	28.2	30.1

forth in Table I, show the reduction in the quantity of combustible matter in the mine dust after two, four and five trips of the duster respectively.

As may be seen, therefore, in a roadway that had not been previously treated in any manner the dusting machine after traversing the roadway only twice reduced the combustible matter in the mine dust from an average of 58.3 per cent to 46.3 per cent. After traversing the roadway four times the combustible content of the mine dust fell to 35.7 per cent, and a fifth trip brought it down to 28.2 per cent.

Hand Methods of Dust Spreading Preferred

Opinions differ as to which method of stone dusting is the most efficient. It is probable, however, that most people prefer hand methods, though there is much to be said in favor of traveling machines, especially where the air velocity is high. The chief advantage of hand dusting is that dust may be thrown forcibly against the ribs and roof, displacing coal dust that may be lodged there. As its angle of repose is greater than that of coal dust, both the material dislodged and the coal dust carried by the air current falls to the floor where it may be gathered up. Before attempting to remove the coal dust lying on the floor, however, it is advisable to dampen it, as otherwise a large portion of it is liable to blow away.

The provision in the Mine Regulations that "representative samples of dust from the floor, roof and sides shall be taken over a section of road not less than 50 yd. in length" is highly ambiguous and might be construed in any one of several ways. The interpretation generally accepted, however, is that this refers to an average piece of road 50 yd. in length. At 5-yd. intervals along this stretch of roadway the whole of the dust from a strip 6 in. wide and extending entirely around the perimeter of the passage is collected. The sample thus secured is intimately mixed and quartered down to a suitable size. Next, it is passed over a screen of 28 meshes to the linear inch, and only that portion of it passing through, retained. This is then analyzed for moisture and combustible matter in the usual way.

Special tests have been prescribed for (a) dust mixtures that contain carbonates, (b) moist dust mixtures that cannot be screened and (c) dust mixtures that contain gypsum.

In addition to the monthly samples collected by the management, the government mine inspectors take samples at nearly every mine they visit in order to to satisfy themselves that really representative samples are being taken by the mine authorities.

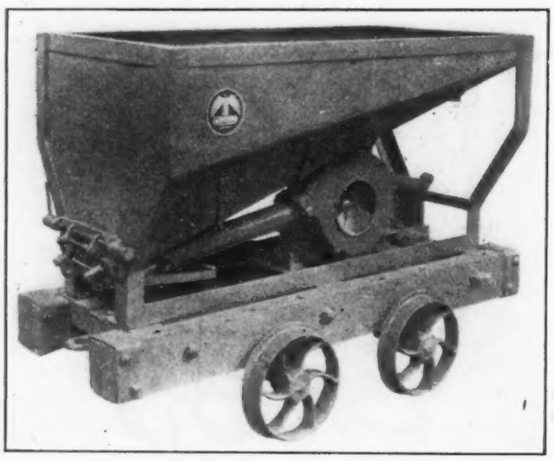


Fig. 8—Front View of Oldham Machine

This car may be drawn or pushed along the track emitting its cloud of dust as it goes. This dust cloud is caught up by the ventilating current, carried along the heading or roadway to settle everywhere upon roof, ribs and bottom. Although this method of stone dusting would appear highly effective many operators prefer hand methods of dust distribution, chiefly because in hand spreading, dust may be thrown violently against the surfaces to be treated, thus displacing any coal dust that may have lodged there.

Table II—Cost of Stone Dusting in British Mines

	Collieries A	B	C
Output of coal (gross tons) during period under consideration	11,500	194,935	3,500
Gross tons of stone dust used during same period	25	367	4
Stone dust used per ton of coal produced	4.9 lb.	4.21 lb.	2.5 lb.
Cost of stone dust per ton	$4.86	$1.02	$3.54
Cost of handling and distributing stone dust per ton	$2.25	$9.54	$3.63
Cost of stone dusting per gross ton of coal produced	1.64c	0.426c	0.81 1c

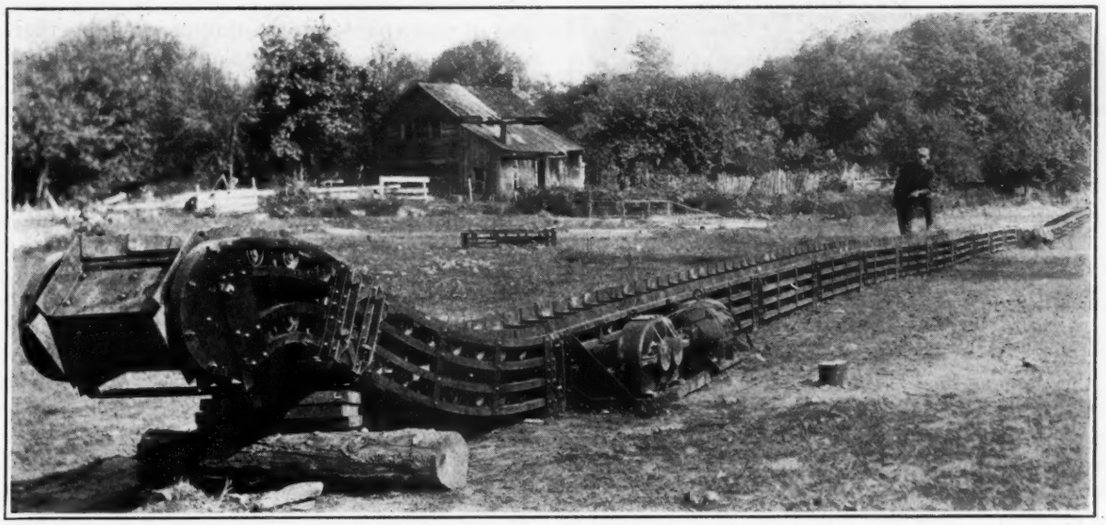
It is difficult to state average costs of stone dusting, as conditions vary widely. The actual expense is influenced by the following factors: Length of road, quantity of coal passing over it, nature of coal and rate of deposition of coal dust, which itself is influenced by the type of car, condition of track, kind of haulage and the method of working the mine. On the basis of coal output, some mines require only 1 lb. of stone dust for each ton of coal produced, whereas others require from 10 to 12 lb. It will be seen, therefore, that costs may vary between wide limits. Some typical costs, however, are set forth in Table II.

Primary Considerations of Stone Dusting

To summarize, the most important points observed in British stone dusting practice may be enumerated under the following eight headings:

(1) The fineness of the stone dust used is the most important factor. (2) At least 50 per cent incombustible matter should be maintained in the dust of roadways. (3) No dust dangerous to health may be employed. (4) It is better to prevent the initiation of an explosion than to concentrate efforts on stopping it after it has once started. (5) Careful attention should be paid to methods of shotfiring and the type and condition of safety lamps used. (6) Dust should be regularly cleaned from the roads. (7) Stone dust should be distributed regularly either by hand or mechanical means. (8) Regular and systematic sampling and analysis should be practiced in order that the condition of the roads and traveling ways may be at all times known.

Ballistic Mortar Tests.—A ballistic mortar, with aluminum suspension plates of the type generally used by explosive manufacturers, has been installed at the explosives' laboratory of the Bureau of Mines at Pittsburgh, Pa. This apparatus will be used to determine the deflective force of commercial and military explosives, and to correlate the results obtained with the Bureau of Mines' type of mortar with results obtained by manufacturers.



Rugged All-Steel Sectional Portable Conveyor Co-ordinates Mining and Haulage

Constructed in Short Sections Each of Which Can Be Carried by Two Men—Pins Are Used Instead of Bolts as Fastenings—Several Motors Used When Long Conveyor Is to Be Driven—Machine Easily Shifted

MECHANICAL loaders capable of handling coal within the mine at capacities up to 4 tons per minute, have caused operators to begin search for some kind of continuously-moving mechanical device capable of transferring this coal from the shovel at the face to the room neck, to a sidetrack or even to the tipple itself. By means of a suitable mine layout and the aid of conveyors, they hope to keep their loading machines in operation during a far larger percentage of the time than hitherto has been possible. This would increase the efficiency of labor and limit the area of live workings. The conveyor described in this article forms a connecting link of any desired length between the loader in the room and the mine car in the heading.

Several years ago Walter D. Stockly, now general manager of the American Mine Equipment Co., of Pittsburgh, Pa., on behalf of a large coal company, investigated the performance of an electric loading machine in operation in one of the coal company's mines. He found that the machine itself was correctly designed, well built and when in operation handled coal cheaply and at a rate exceeding a ton per minute. So much time, however, was lost in switching cars to and from the machine and so many other delays and expenses were encountered that the coal loaded mechanically cost as much as that loaded by hand in other parts of the mine.

Heretofore, this has been the chief obstacle to machine loading. After this investigation much thought was expended on ways and means for surmounting the difficulties encountered. It became obvious that if a suit-

NOTE—Headpiece shows a 200-ft. conveyor fitted with two driving sections, each equipped with a 5-hp. motor. The uneven meadow land upon which this unit is set up clearly demonstrates its flexibility.

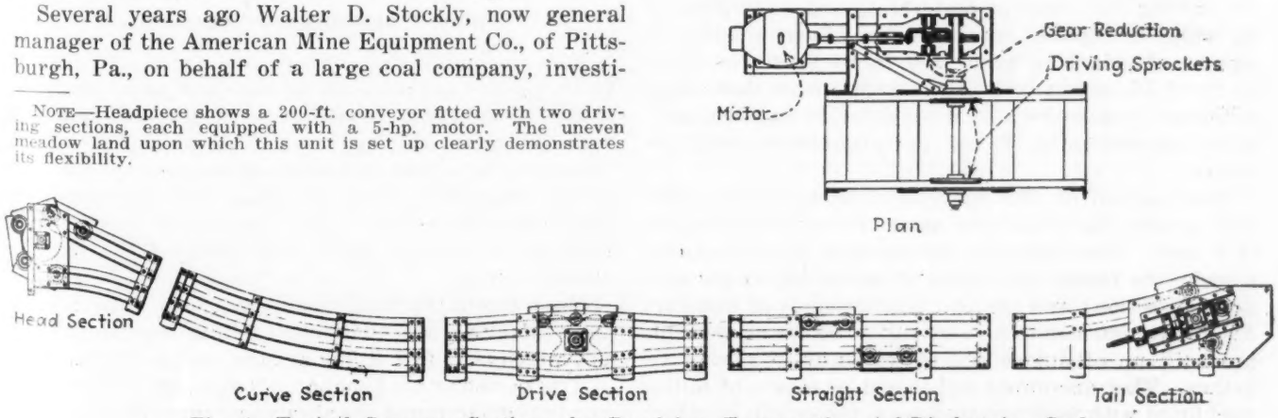


Fig. 1—Typical Conveyor Sections, for Receiving, Transporting and Discharging Coal

Each conveyor unit consists of one head, one curved, and one tail section together with as many straight and drive sections as may be necessary to attain the desired length and to actuate the unit. Note the contour of the teeth of the driving sprocket.

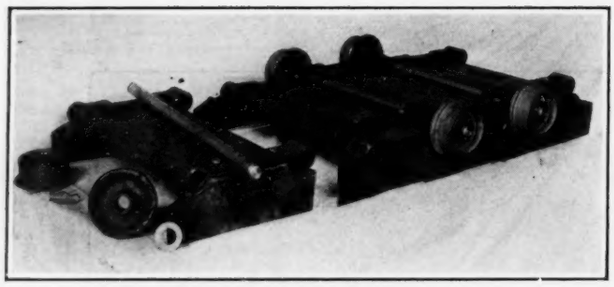


Fig. 2—Details of the Pan Belt

Hinge bars or links riveted to the bottoms of the pans are pinned together by means of the axles. Washers and spring-clip retainers hold both wheels and axles in their proper positions.

able portable conveyor could be designed that would remove the coal as fast as a shoveling machine could handle it, the cars could be loaded in the heading and the filling of cars would become much more nearly a continuous operation. A smaller crew would be necessary, and costs would be decreased.

Learning after a time that the West Virginia Coal & Coke Co., of Elkins, W. Va., was working upon a similar idea and attempting to produce coal by modified longwall operation by the aid of conveyors, Mr. Stockly joined his efforts with those of this coal company. Basic designs of what is now known as the Movor conveyor were thus developed. This device was mentioned in the Feb. 7 issue of *Coal Age*, p. 197, in describing what is known as the V-system of mining.

A Portable Conveyor Is Developed

The Movor conveyor is of the pan-belt type, built entirely of steel and is portable, because it is sectional. A unit must comprise four parts: a head, a curved, a drive and a tail section. As many straight sections may be added as are needed to secure the desired length. If, however, the number necessary is more than can be actuated by one drive section, additional drive sections may be added at will.

All sections, except those forming the head and tail of the conveyor, are interchangeable so that a unit of any length may be built up. If greater rise is required at the delivery end than is afforded by the curved section, one or more straight sections may be interposed between it and the head section, so that any height of discharge may be attained.

In short, the design of this conveyor is such that great flexibility is obtained. All motors normally used for driving the conveyor on level ground, regardless of its width or capacity, are of 5 hp. Such a motor is capable of actuating about 100 ft. of 20-in., or 70 to 80 ft. of 36-in. pan belt. Conveyors longer than those mentioned require two or more drive units, each operating independently of, but in synchronism with the others.

Each section of this conveyor is complete in itself. This greatly facilitates the assembly or transportation of a unit. Two elements are common to all sections, namely, the frame (the shape of which differs for each type of section) and the pan belt which is of standard design and common to all sections. The frame elements are built up of angles and plates securely riveted together. They are joined end to end by means of slotted pins fitted with wedge shaped keys, the details of which may be clearly seen in several of the accompanying illustrations.

The belt is composed of pans, pressed from ⅛-in. steel plate, to the back of which are riveted or bolted two flat steel hinge bars or links; axles passing through the eyes of these bars couple adjacent pans together. These axles carry the supporting flanged wheels which run on tracks attached to the frame. Each wheel is held in place by a washer and a spring clip that fits into a suitable groove in the axle. The belt is driven by sprockets acting on the wheels.

This construction entails the use of a minimum number of parts. The axles serve as pins joining together the hinged bars which in turn form part of the pan. The wheels support the load, hold the axles in position and are acted upon by the driving sprockets. The spring-clip retainers fastening the wheels in place can be quickly applied or removed without the use of tools.

For use in rooms and other places where the quantity of coal to be handled does not exceed 100 tons per hour,

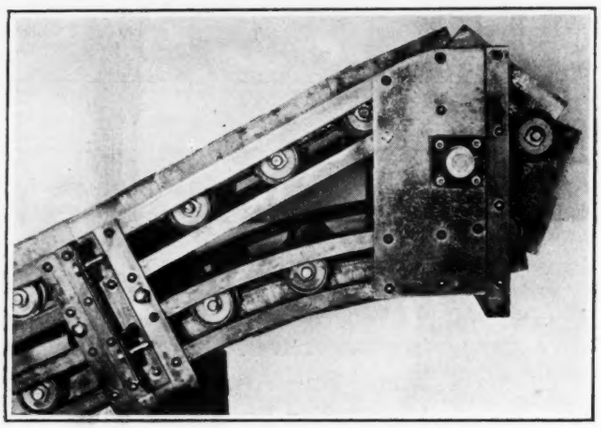


Fig. 3—Head or Discharge Section

The pans make the turn at the end of the conveyor by passing around suitable sheave or turn wheels. The bearing and return tracks on this section are somewhat divergent to enable the belt to make the turn.

the conveyor pans are 20 in. wide, 4 in. high and have a pitch of 9 in. Such a conveyor has a calculated capacity, when carrying loose coal, of 1 ton per hour for each foot of conveyor travel per minute. At a speed of 100 ft. per min., therefore, such a conveyor has a calculated capacity of 100 tons per hour. In performance, however, the capacity actually obtained is somewhat greater than this. For ordinary use, the speed of travel is reduced to 50 ft. per minute, giving a corresponding capacity of 50 tons per hour.

Wide Units Used on Headings

Main-line units that receive coal from a number of 20-in. feeders are made 36 in. wide and have sides 6 in. high. Aside from the increased width and height of such conveyors, all elements and parts, such as wheels, wheel retainers, motors and speed reducers are the same on the large units as on the small ones and are interchangeable with them. The capacity of a wide unit, however, is roughly eight times that of the small or auxiliary unit.

Even when carrying this heavy load little spillage occurs, only an occasional lump rolling from the moving pile which is 1½ to 2 ft. high at the center of the pan belt.

Tracks on the head section diverge sufficiently to permit the belt to round the sheaves or turn wheels, as may be seen in Fig. 3. Next to the head section normally is placed a curved section which differs from a straight

one only in that by it a gentle change in direction of the track is obtained. This is necessary in order to gain the necessary headroom for the discharge of the coal. As may be seen in Fig. 4, the head and curved sections are supported in normal position by means of timber blocks.

A head section placed as has just been described gives a proper elevation for discharge into a main-line conveyor. If the coal is to be discharged into a mine car, a straight section is interposed between the curved and the head sections. When this is done, the conveyor is sufficiently flexible so that a foot or more of difference in elevation above or below the normal discharge position may be obtained.

Height of Conveyor Only Eighteen Inches

Little need be said as to the straight sections, for Fig. 5 shows much of their detail. In any ordinary conveyor the number of these sections employed predominate, and fortunately they are the simplest in both design and construction. The height of these sections is 18 in., making the conveyor suitable for use in a 3-ft. coal bed.

A typical drive section is illustrated in Fig. 6, and Fig. 1 shows it in both plan and elevation. Drive sections are interchangeable with straight ones. In a section of this kind, however, the upper track is humped slightly upward and the lower one has a similar curve, but in an opposite direction so that room is made between them for the driving sprockets which engage the wheels of the pan belt. The drive mechanism is simple, both in design and operation. The contours of the driving-sprocket teeth are true involutes, imparting a uniform movement to the pan belt with little of the jerk and slap inherent to conveyors driven at one end.

Both upper and lower runs of the pan belt are engaged by the sprockets simultaneously, and as the belt is adjusted by a take-up on the tail section, there is little slack at either end. Consequently, wear on the hinge bars and axles due to rounding the end sections does not exceed that in traveling horizontally.

By relieving the tension at the ends of the conveyor excessive wear is eliminated, and the maintenance cost is thereby reduced. Because of the smoothness of the drive, this conveyor can be operated at high speed. Application has been made for broad patents covering the drive and other details.

Two or more drive sections embodied in a single unit function as smoothly as one. When properly placed, each takes an equal portion of the load and the stresses on any part as compared with those existing in a conveyor of equal length provided with only one drive, are reduced to a fraction, of which the numerator is one and the denominator the number of drive sections employed. Apportioning the load on a long unit to two or more drive sections, reduces the size and weight of each, thus giving portability to the entire equipment.

The gear reductions employed on the drive sections are equal in quality to the transmission of a high-grade automobile. Gears and gear shafts are made of carefully heat-treated alloy steel. They operate in oil-tight housings and are carried on high-duty precision roller bearings.

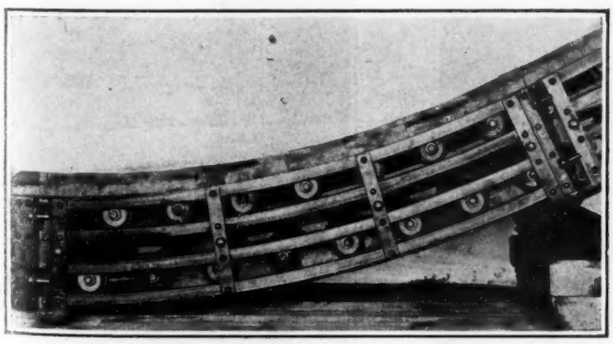


Fig. 4—A Typical Curved Section

When one conveyor discharges onto another a curved section is adjacent to the head section: when however discharge is made to a mine car a straight section is interposed between head and curved sections. This is done in order to gain the necessary height for the coal discharge. Note the slotted pins and wedge keys holding the frames of adjoining sections together.

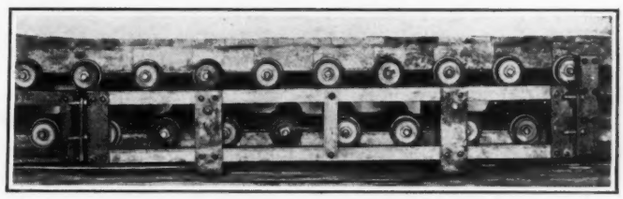


Fig. 5—Straight Entry and Face Sections

The central section shown in this illustration is the type employed on entries. Its frame carries two angle irons which serve as bearing and return tracks for the pan wheels. The section on the right is intended for use at a face. The frame of this section carries two additional angle irons that retain the wheels and prevent derailment in case of a fall of roof or coal.

The tracks on the tail section like those at the discharge end of the conveyor are made slightly divergent to facilitate the transfer of the pan belt from the lower to the upper run, as may be seen in Fig. 7. The tail sections are also provided with suitable sheaves or turn wheels. Unlike the head sections, however, the tail sections are provided with take-ups not only to compensate for the elongation of the moving parts as the result of wear but also to facilitate the insertion or removal of various sections by taking up or paying out slack in the pan belt.

This conveyor is of simple design and rugged construction. The two primary objects sought were low maintenance cost and the expenditure of the least possible time and effort in assembling or dismantling a unit. Every man experienced in underground management knows that bolts and nuts, exposed to the humid atmosphere encountered in the mine, as well as to the acid water dripping from the roof or collecting in pools on the floor, should be avoided if possible.

Bolts and Nuts Confined to Drive Section

He knows full well the state of mind of a workman who encounters a nut which is rusted fast to its bolt or has been cross-threaded upon it; he has often heard the outbursts of "cussing" as such a man attempts to manipulate two wrenches, one to hold the bolt from turning and the other to remove the nut. Skinned knuckles or bruised hands are liable to result. In the Movor conveyor, bolts and nuts are confined to the drive section. It is necessary to remove only a few of them in dismantling prior to moving the conveyor. These are of such large size as not to be lost or misplaced easily.

For the addition or removal of one or more sections of the conveyor, a crew of only two men is required. When the unit is to be lengthened, one man works on either side of the conveyor. First the take-up screws on the tail section are backed off to give the pan belt a certain amount of slack. Then the spring clips retaining a

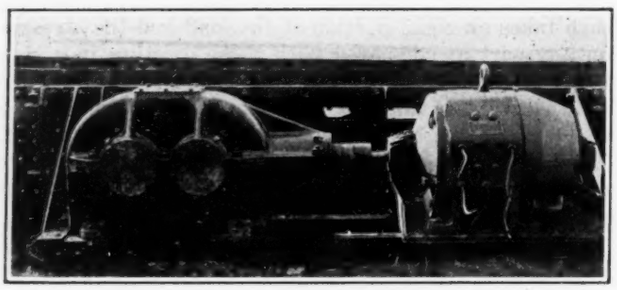


Fig. 6—A Conveyor Drive Section

In moving a conveyor unit each drive section may be separated into five elements. These are: Motor, speedreduction gear, bracket, frame and pan belt. Each may be handled separately.

wheel on both the loaded and return strands of the pan belt are removed from one side of the conveyor and the axles are pulled out by the man on the other side. Next the wedges are knocked out of the slotted pins fastening the tail section to the adjoining section, after which the tail section is pulled away a sufficient distance to accammodate as many additional straight sections as are desired. These, together with a strand of pan belt on both the upper and lower tracks, are then pushed into place. The frames of the various sections are fastened, end to end, by means of the slotted pins and wedge keys; the ends of the pans are brought together; axles, wheels and spring clips are replaced, and after the take-up screws have been tightened to afford the proper tension, the conveyor unit is ready for operation. Substantially the reverse procedure is followed in shortening a unit. One straight section can be added or removed by experienced men in 15 min. or less.

An Uncoupled Unit Is Easily Moved

The ruggedness of this conveyor does not detract from its portability in sections or in elements. When assembled, so flexible a unit is formed that it may be shifted bodily throughout short distances, either sidewise or endwise, without injury to any part. For this purpose, a block and tackle, a post puller or the chain or cable of a mining machine may be used. Shifting either endwise or sidewise is facilitated by two U-shaped steel straps forming part of each section. These pass under the frame, and the weight of the conveyor rests upon them. In making a shift, they serve the same purpose as the runners on a sled.

When a unit must be moved from one face to another, or from entry to entry, it must of course be dismantled and the transfer made in sections and elements. The head and tail sections are respectively 3½ and 5½ ft. in length. All other sections are 6 ft. long. The frame elements of the head, tail, straight and curved sections weigh about 200 lb. each and are thus a load for two men. The pan belt proper is removed from the frame and moved separately. One man can handle 3 ft. of it weighing about 120 lb. The heavy elements of the drive section, such as the frame, motor and gear box weigh from 300 to 600 lb. each and consequently require a truck for moving over any great distance. Several thousand feet of this conveyor in an old section of a mine has been dismantled, moved a distance of 2,000 to 3,000 ft. to a new location, and assembled again, all within the space of two days.

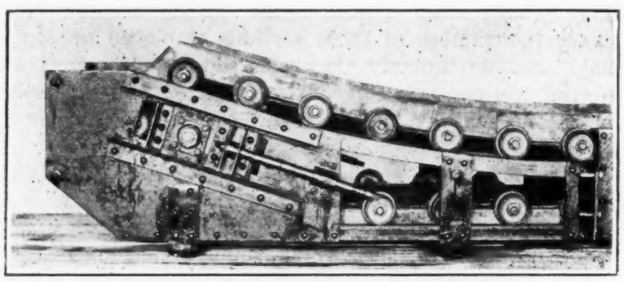


Fig. 7—Tail Section of the Conveyor

In appearance the tail section much resembles the head section. The tail section however is provided with a pair of takeups to permit of quickly adjusting the tension on the pan belt.

Not only is this conveyor suitable for transporting coal over level ground, but it may be used on slopes as well. A unit 500 ft. long on a 30-deg. pitch will have a rise of about 250 ft. Eight drive sections at intervals of 60 ft., each equipped with a 25-hp. motor will move the coal at the rate of 500 tons per hour. The cost of this equipment, for a slope of the characteristics outlined, is less than that necessary for shaft equipment of equal capacity.

G. F. OSLER,
Speaker on Coal Preparation

RALPH E. BECKER,
Chairman, Program Committee

A. F. BROSKY,
Vice-Chairman, Program Committee

Three of Those Active in Cincinnati Convention

What Anthracite Region Is Doing to Make Fine Sizes of Coal More Readily Salable

Jigging, Tabling and Floating Are Cleaning Processes in Use—Jigs Now Operate Without Suction and Stratification Occurs in Quiescent Liquid—Whole Art in State of Flux

By Frank H. Kneeland
Associate Editor, *Coal Age*, New York City

"How to dispose of the small sizes," said a hard-coal man recently, "is the nightmare of the anthracite operator." Every little while the problem seems nearer solution, but a new factor will enter to make success less certain. It is true that the finer sizes can be used today more widely than ever before. Automatic stokers have made them available for industrial use. Special devices have enabled householders and apartment-house keepers to use them for domestic heating. It has been demonstrated also that, after pulverizing, this coal can be burned suspended in air, and briquetting has furnished another means of using anthracite fines.

During the war the use of bituminous coal in place of anthracite was greatly extended, better combustion and coal shortage making municipal authorities lienent. Oil, coke, gas and even bituminous coal commenced to drive out anthracite and those enterprising persons who were disposed to adopt a new and cheap fuel like buckwheat were lured, in many instances, to other fuels promising some advantage or convenience.

Must Free Fine Sizes of Impurity

Anthracite small sizes have therefore a hard fight before them, and to fit them for the battle it is necessary to free them from the ash which reduces their heating equivalents. They cannot be hand picked. It would be an endless task to clean by hand a ton of No. 2 buckwheat, for instance, and the cost would be altogether out of proportion to the enhanced market value of the fuel. But the coal must be cleaned, so producers have been seeking with diligence mechanical means for cleaning their small sizes while not neglecting the opportunity to improve the treatment of their larger coal.

As a result many devices for screening, picking and washing within a comparatively short time, have been developed and placed on the market. Among these might be mentioned the "W-dent" screen plate and the Mason flat slate picker; also various machines such as the Reilly-Knapp, the Ransom, the James jigs, the Wilmot valve-plunger jig and another type now in the embryo stage, concerning which little can be said at present except that the laboratory model has given excellent results. These have been supplemented by such other coal-cleaning devices as the various concentrating tables, the Chance separator, the Rheo-Washer and more recently by another machine as yet unnamed which gives promise of excellent results. A few of these will be described.

One of the newer coal-cleaning devices now being used, but one that has been tried long enough to demonstrate thoroughly its practicability is the Ransom jig. This machine is so designed that it separates the coal from the impurities accompanying it by means of upward pulsations of water only, the product to be treated being allowed to settle freely in a practically quiescent liquid.

To obtain this action a plunger operating in compartment *A*, (see Fig. 1) is fitted with light valves opening downward. These valves therefore open on the up and close on the down stroke. In the side of this compartment is placed a series of deflection vanes which give the water an upward motion as it enters the screen or separation compartment *B*. Light valves are also placed in the wall of this compartment preventing any backflow of the water as the direction of the plunger movement changes.

In operation, the feed, consisting of the mixture of coal and slate just as it comes from the screens, enters the jig in the usual manner, gaining access to the screen compartment by passing under a gate. On the screen *C* the coal is subjected only to upward pulsations of

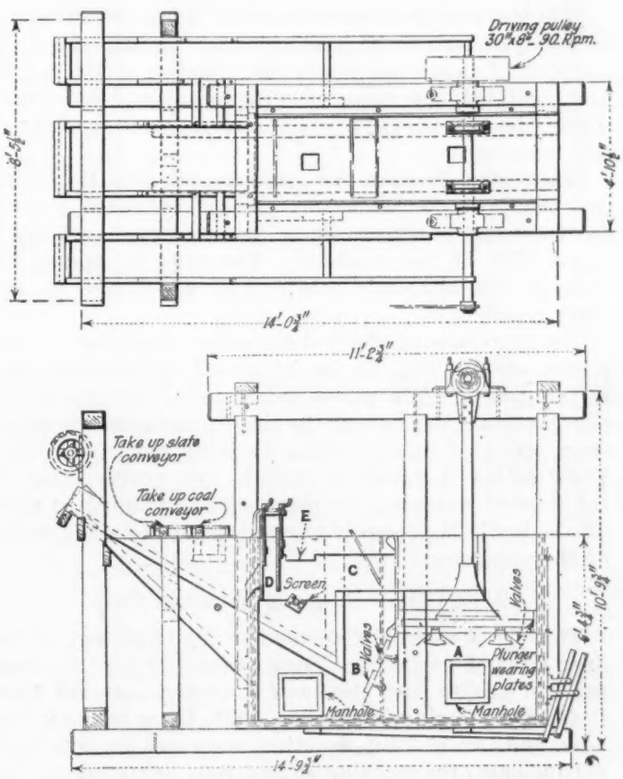


Fig. 1—Plan and Elevation of Ransom Jig

Because of the valves in the bottom of the plunger and those in the side of the screen compartment, water is forced through the screen in a series of upward pulsations without appreciable back suction. The bed of material being jigged is thus lifted sharply from the screen and allowed to settle back in practically quiescent water.

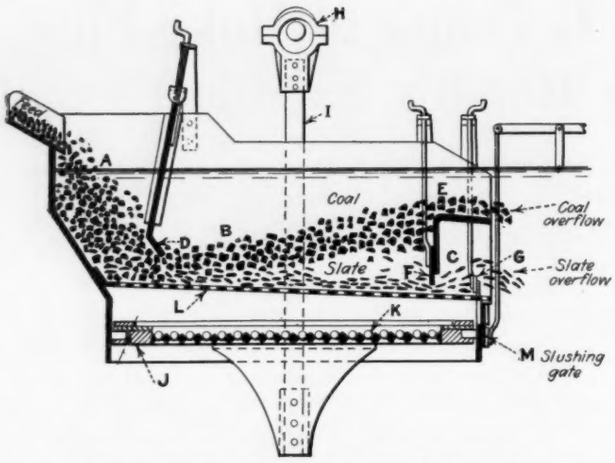


Fig. 2—Section Through Valve-Plunger Jig

As the plunger moves up and down the valves, which open upward, cause the water to be forced up through the screen in a series of pulsations. The action on the material jigged is much the same as that secured in the machine shown in Fig. 1, settlement of the bed taking place in practically still water.

water from the plunger compartment, the valves preventing any back flow, or back suction. The bed of material jigged is thus lifted from the screen and allowed to settle back in practically still water.

Particles Settle in Quiescent Water

Naturally the particles stratify according to their respective specific gravities, that is, the pieces of highest specific gravity seek the bottom, those somewhat lighter soming next and those of least specific gravity, or the pure coal, seeking the top of the jig bed. Not only is the stratification more perfect, but the grinding of particles against each other is less pronounced in a machine of this kind, where the material in the jig is first agitated and then allowed to settle freely than where the pulsations of water are alternately upward and downward.

When stratification has become complete the good coal overflows notches at the sides of the jigging compartment and is withdrawn by two conveyors, one upon either side of the machine. The slate is drawn off through the automatic gate *D* and is removed by another conveyor.

The thickness of the bed of rock maintained on the screen surface may be varied at will by manipulation of the gate *D*. The valves on the lower surface of the plunger and in the side of the jig compartment are made from strips of balata belting fastened along one edge. Their action is therefore so light and positive that if the flow of water to the plunger compartment is shut off the liquid is promptly pumped down below the reach of the plunger.

Will Clean Pea and Smaller Coal

This jig is especially adapted to the treatment of the finer sizes of anthracite, being ordinarily used to clean pea and smaller coal. Some of the results secured from it follow: During November, 1923, three tests, one of 4-hr. and two of 7-hr. duration, were run on three successive days, the machine at that time operating on No. 1 buckwheat. Throughout these tests samples were taken of both the coal and refuse every 20 min. to a half hour with the following results: Maximum quantity of coal in rock discharge 8 per cent; minimum, 6 per cent; average 7½ per cent. The quantity of slate in the coal discharge showed no variation, being 3 per cent in all cases.

Another washing device that has made its appearance within comparatively recent months is that known as the Wilmot valve-plunger jig. A cross-section of the bed of material being treated in this machine is shown in Fig. 2. This jig also employs the cup-and-gate refuse discharge on anthracite sizes smaller than ¾ in. This, however, may be used also on larger sizes.

In this machine the jig box is divided into three main divisions designated in Fig. 2 as *A*, *B* and *C*. Sized coal as it comes from the screens enters the feed hopper *A*. Thence it passes under the adjustable gate *D* into the jigging compartment *B*. Here it stratifies under the action of pulsations of water from below, heavy pieces going to the bottom and the good coal, which is lighter, seeking the top of the jig bed. Accordingly the coal overflows at *E*, and the slate escapes through the refuse compartment *C* and over the gate *G*.

In this jig the water is given a series of upward pulsations. The plunger *J* is actuated through the connecting rods *I* by the eccentrics *H*. In the top of the plunger is placed a series of light valves *K* that open on the downstroke but close on the upstroke forcing water through the screen *L* in pulsations much like those from an ordinary hand pump.

As may be seen the screen *L* is set at a slight inclination. The gates *D*, *F* and *G* are all adjustable so that the feed going to the machine as well as the slate discharge may be readily controlled. The slushing gate *M* is opened occasionally to free the space above the plunger from any fine material that may have found its way downward through the screen *L*.

Discharge Gates Remove Different Products

The heights of the discharge gates have been determined in accordance with the specific gravities and sizes of the materials handled. As a rule the height of the coal overflow is left stationary, and the slate gate is adjusted to suit the material treated. If the slate gate is too low some coal will pass over with the refuse; if too high slate will go over with the coal.

The capacity of this jig varies approximately as the

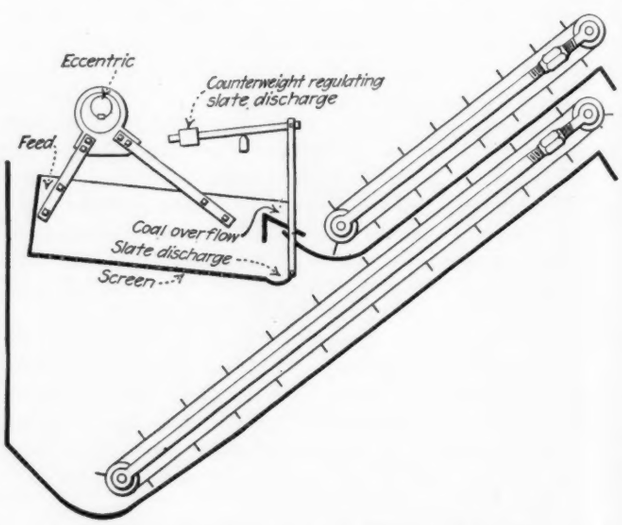


Fig. 3—Cross Section of the Basket-Type Jig

In this machine the basket or pan is moved up and down in a tank of water. The coal is thus washed in much the same manner as it has been cleaned by hand by the Chinese for centuries. This is perhaps the simplest jig of all.

speed of the eccentric shaft. When operating at 140 r.p.m. on buckwheat material passing over a ¼-in. and through a ½-in. circular opening, one of these machines gave the following results:

Quality of feed, 30 per cent slate, 70 per cent coal; after jigging the coal, discharge contained 8 per cent slate and 92 per cent good coal; the slate discharge contained 1 per cent of coal.

At the time this test was made the machine was taking feed at the rate of 25 tons per hour. It thus will be seen that although the machine is somewhat bulky its capacity is large. It is designed and built to withstand the hard and continuous work to which all machines of this kind inevitably are subjected.

Basket, or Pan, Jig and Plunger Jig

Jigs of many different kinds have been perfected and placed on the market. In general these all embody the same cleaning principle although they are of two distinct types, namely, the basket, or pan jig and the plunger jig. In the basket jig (see Fig. 3) the whole compartment or pan containing the materials to be separated is reciprocated up and down in a tank of water. In the plunger type of machine (Figs. 1, 2, 4 and 5) the coal container is held stationary while movement of the water is caused by a plunger.

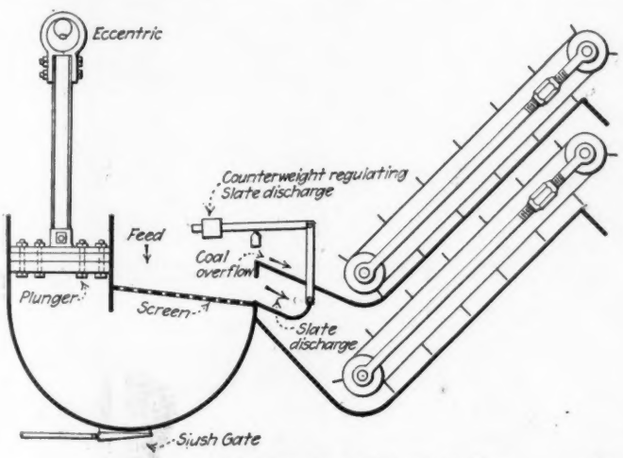


Fig. 4—A Plunger Jig Without Valves

Here the water is caused to surge or pulsate back and forth through the screen and the material supported by it by means of a plunger. Slate is discharged to one conveyor and coal to the other. This machine as well as that shown in Fig. 3 appears to be somewhat better adapted to treating the larger sizes of coal than the smaller.

In any case a jig, although fairly efficient in operation, is a big, heavy machine requiring much floor space. For treating the finer sizes in particular, operators have sought means less bulky and ponderous. To this end concentrating tables have been installed in appreciable numbers. Like the jigs they are of several types but all operate upon the principle that, on a reciprocating table, material of high specific gravity will follow along the riffles of the table while that of light specific gravity will be washed over them.

Various attempts also have been made to separate coal from its accompanying rock by means of flotation. Of these devices thus far perfected the Chance flotation apparatus is probably the best known. In this process a high specific gravity is imparted to water by intimately mixing fine sand with it and retaining this sand in suspension by continuous agitation. This device as well as the construction of a washery employing

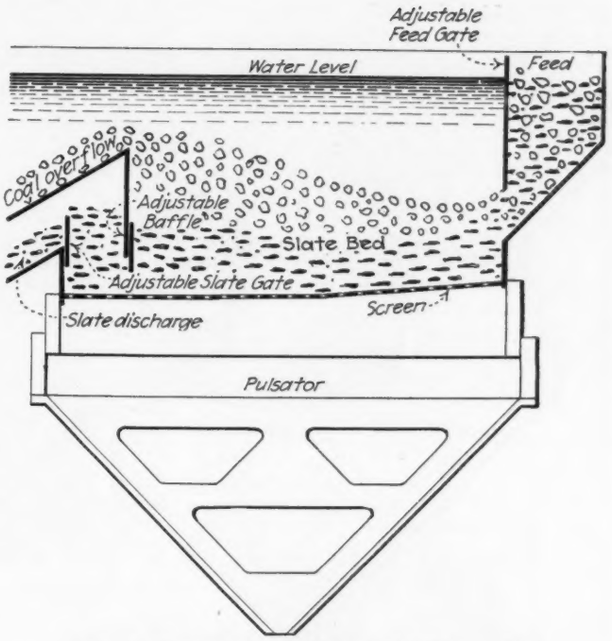


Fig. 5—Pulsator and Bed of the James Jig

In this machine the plunger or pulsator as it is called is provided with valves so that a series of upward pulsations is imparted to the water acting on the jig bed. The action of this machine is similar to that of the jigs shown in Figs. 1 and 2.

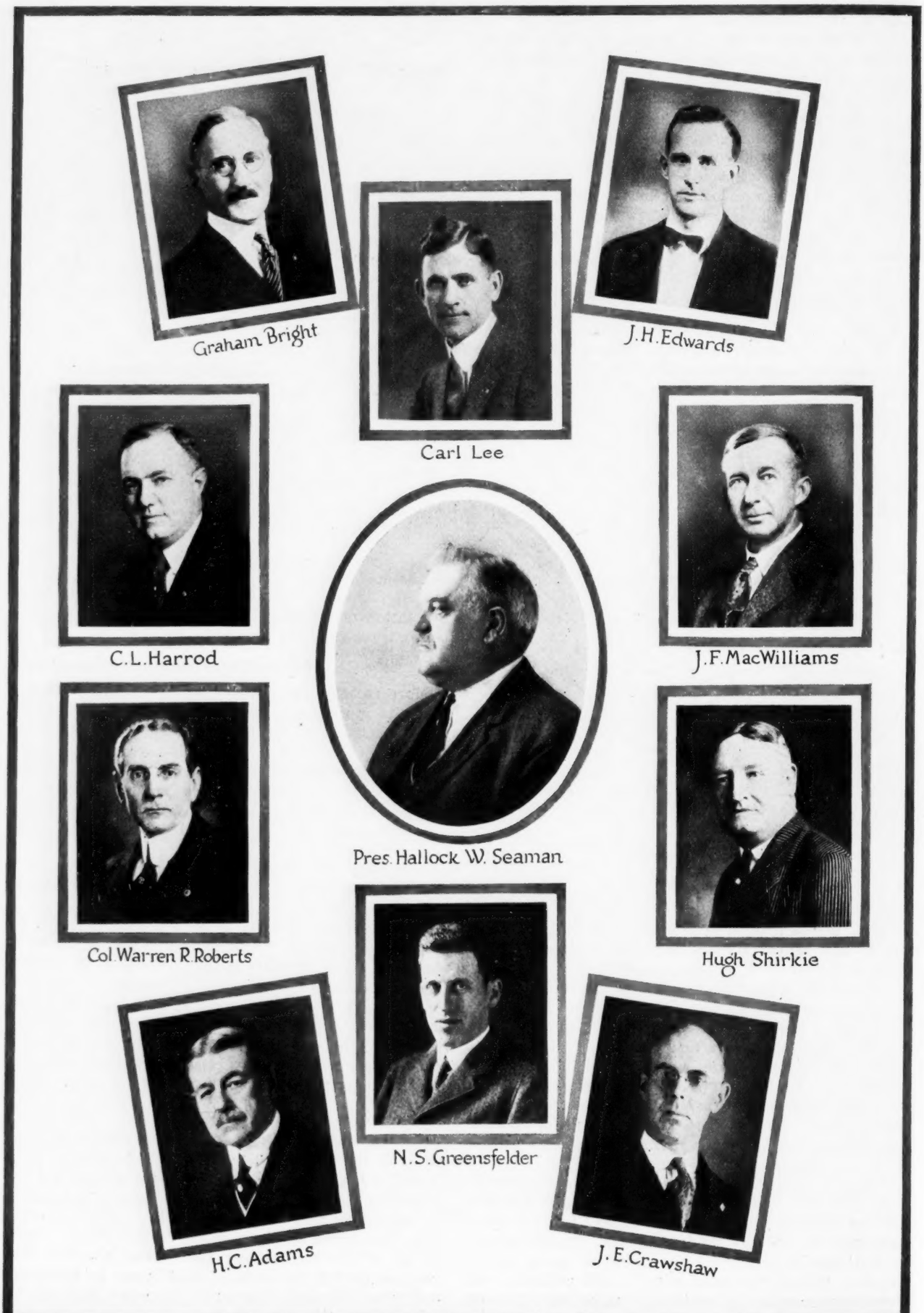
it was described in *Coal Age* of May 4, 1922, page 735. Another article appeared May 1, 1924, p. 633. Being a flotation process, it is not necessary to size the coal before separating the impurities from it.

Depends on Several Principles of Segregation

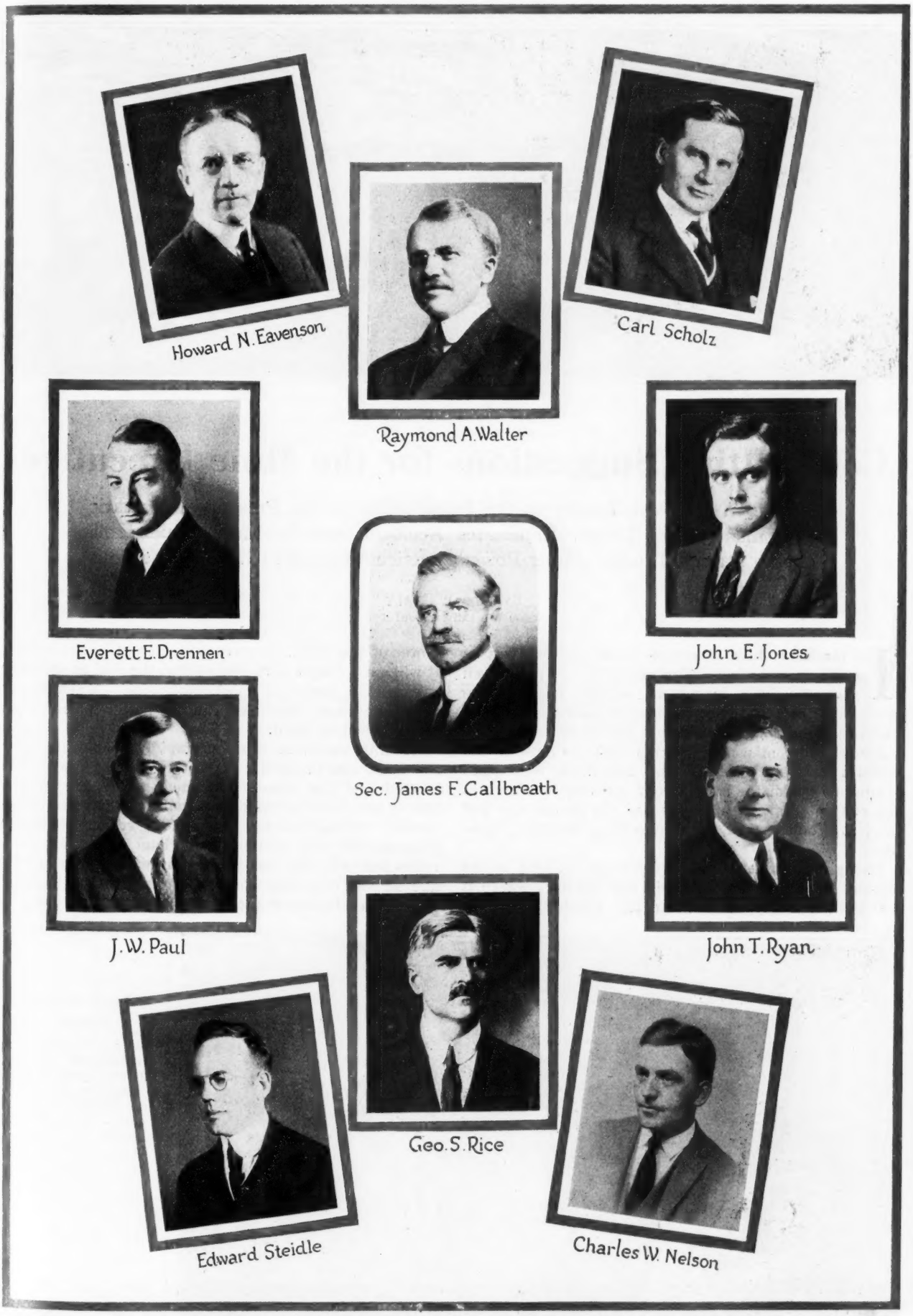
More recently the Rheolaveur, or Rheo-Washer, has made its appearance from Belgium. Although this machine itself is extremely simple, the principle of its operation is somewhat complex as advantage is taken of several properties of coal and slate or rock when immersed in water. This device was described in *Coal Age* of Dec. 6, 1923, page 847, also in the issue of Mar. 27, 1924, page 455. It is now being tried out in the anthracite region.

The whole art of anthracite preparation appears to be in a state of flux; a machine which today may be considered the "last word" in coal preparation tomorrow may be obsolete. Great progress has already been made but present average practice still leaves much to be desired. The small sizes as they come from the shakers in many cases not only contain a larger percentage of impurities than do the larger grades, but unlike the larger sizes, they cannot be hand picked. Of necessity, therefore, the coal producer must look to mechanical means, appliances and processes to clean his small coal if it is to compete in the open market with other fuels.

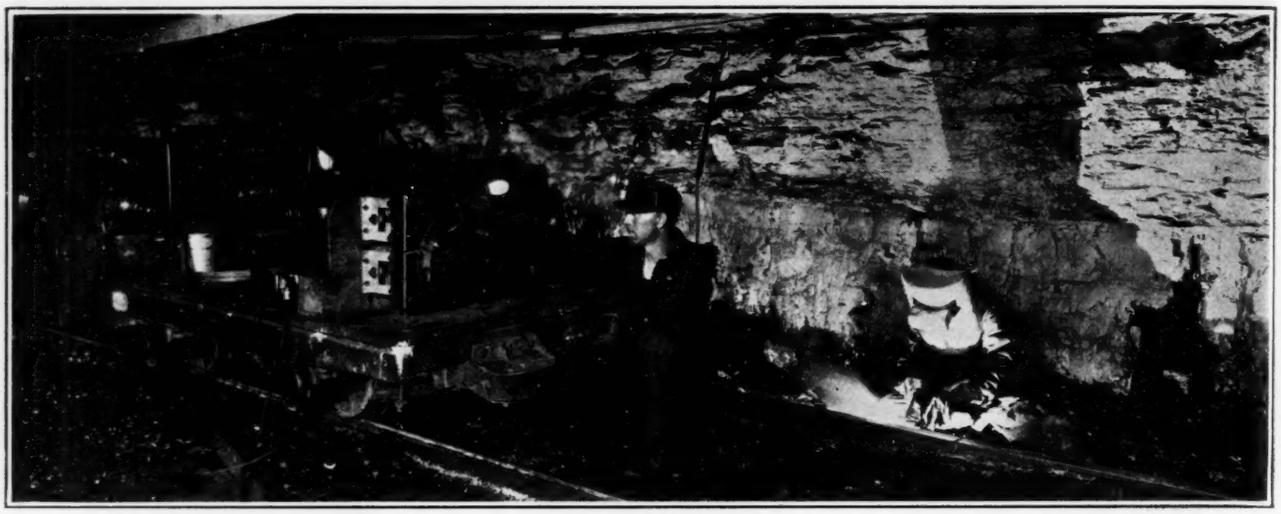
Open Light, the Open Road to Disaster—A recent study of the disaster files of the U. S. Bureau of Mines covering a period of seventeen years reveals the fact that open lights and gas have been the attributed cause of seven fires and 102 explosions in coal mines and of four fires in metal mines, in the United States. Tabulation of the data shows that these disasters were responsible for the death of 2,341 men, injury to 376 and great damage to property—in some instances the mine being entirely wrecked.



Speakers on Electrical, Preparation and Shooting Problems at Cincinnati Coal-Mining Convention with President, American Mining Congress



Speakers on Mechanical Loading and Rock Dusting Problems at Coal Mining Convention, Cincinnati Ohio, with Secretary, American Mining Congress



Stopping Up the Power Leaks During Night Shift

Cost-Cutting Suggestions for the Mine Executive

Savings in the Past Testify to the Possibilities of the Present—Automatic Equipment Saves Labor, Eliminates Accident and Is More Dependable Than a Station Tender—Super-Power Practice Adaptable to Mine Conditions

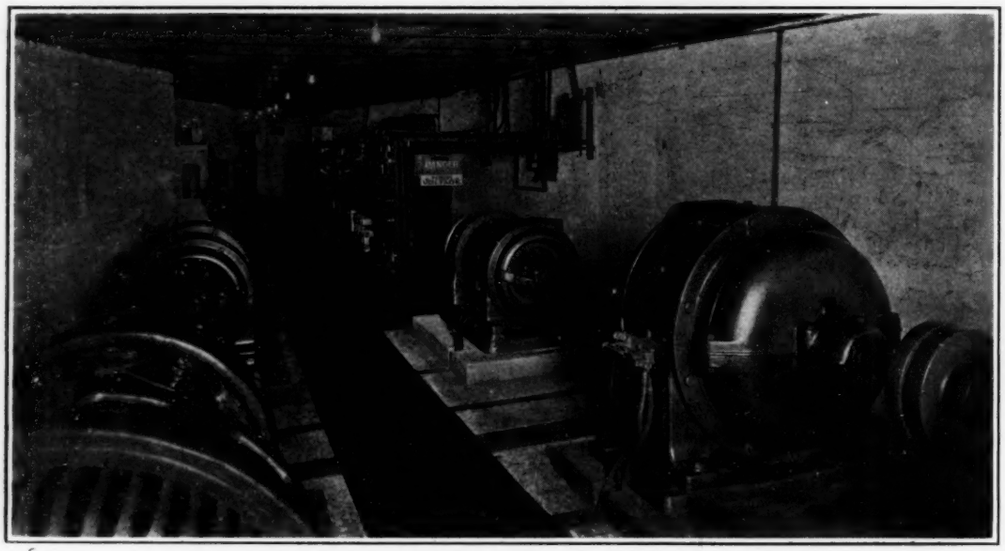
By Edgar Gealy
Associate Editor, *Coal Age*

"In the next three years as much advance will be made in coal-mine equipment as in the past seven years," said a prominent mining engineer recently, and the interest of the mining public in the possibilities of mechanization amply justify his statement.

Almost every man now working with his muscles can perform his labor easier, cheaper and better by the aid of equipment, for the human body is slower, weaker and less efficient than the machine and the human eye and ear less attentive and responsive than electrical apparatus.

Though the miner must perforce cut his kerf in the bottom, the machine cutter will put the kerf where it will do the most good, at the top, bottom or in the center of the seam. It even will cut out a dirt streak. It will cut a deeper kerf also so that the coal on shooting will fall in lumps of marketable size. When power drills are used, shotholes can be better placed than when drilled by hand.

Loading machines work so rapidly that when they are used, less timbering is needed and the coal is extracted and the place is vacated before the bottom heaves and the drawslate falls, and both have to be removed. Storage-battery locomotives reduce operating charges, for they will not only haul more cars than mules but they also "eat no hay" when the mine is idle, and in low coal they save much deadwork. Haulage locomotives transport more coal in a trip and move at



Inside Power Station

More and more, transformer and power - converting apparatus are being installed in the mines. In some respects this is due to the need for a shortening of feeder cables. Many engineers find that this is the only way to minimize the effects of bad bonding.

higher speed, saving in manual labor and making possible the delivery of more cars. The replacement of steam by electricity also serves to save power, for electric hoists use power only when raising loads, preventing the waste of steam and heat when the hoist is not running.

Automatic apparatus not only saves labor but responds more promptly to demands made upon it than do the men who are put in charge of substations not thus equipped. They put the power at proper voltages where it is needed. Line and feeder control devices maintain the power on circuits and localize troubles which otherwise might shut down the entire plant and lower the morale of the working force.

Not only are the new devices more certain, effective and economical, but they also afford greater safety. Control apparatus not only automatically starts and stops equipment, but some of these accessories operating with a certainty almost uncanny protect both equipment and workmen. Many machines are started and stopped by remote control so that the workman who sets them in motion or stops them is at no time in danger. A relatively new use for electricity is gangway and face illumination and its introduction has greatly reduced mine hazards.

Increased speed is the keynote of success in the coal industry; every operation must be speeded up to keep in step with the fastest moving equipment. Most important of all is the continuous flow of coal, so that every machine and man will be able to devote full time in productive effort. Friction, the bane of speed and production, is being greatly reduced. Anti-friction bearings, applied to mine cars and idler pulleys for long conveyor-belt systems, lower energy costs and increase the capacity of present power units.

Proof That Better Equipment Lowers Cost

It is an undisputed fact that these changes will greatly reduce operating costs. Where long steam pipes have been replaced by electric power lines the investment in many instances has been returned in two or three years. One large mining company, almost completely electrified, is now generating more power than the public-utility company which supplies the principal city and the adjoining municipalities of that same region. This coal company is now spending $1,000,000 to increase the capacity of a single power plant. The engineers have determined that electrification of the hoisting shafts will save $600,000 annually.

Safe Enough for Anyone

By supplying the workman with power-driven machinery which he can operate safely, half the work of gathering cars on the main branches is done before the gathering locomotive returns for another trip.

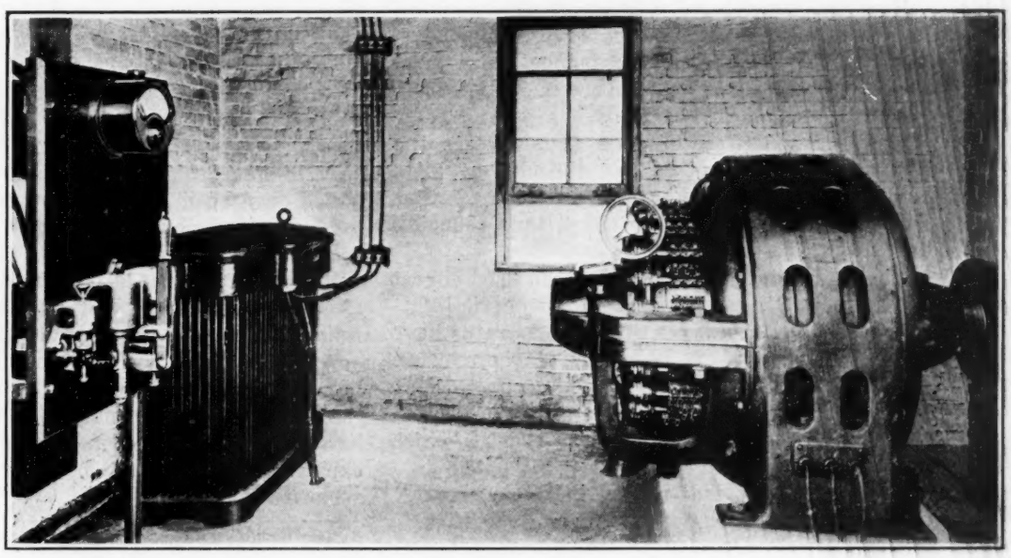
There is not a coal company anywhere which cannot reduce its costs by a further application of machinery. From a survey of the field it is obvious that much new machinery has been so well developed that its effect in cutting cost can be predicted with confidence. Nearly every company is doing at least some one thing better than the others, and valuable information can be gathered by an interchange of ideas.

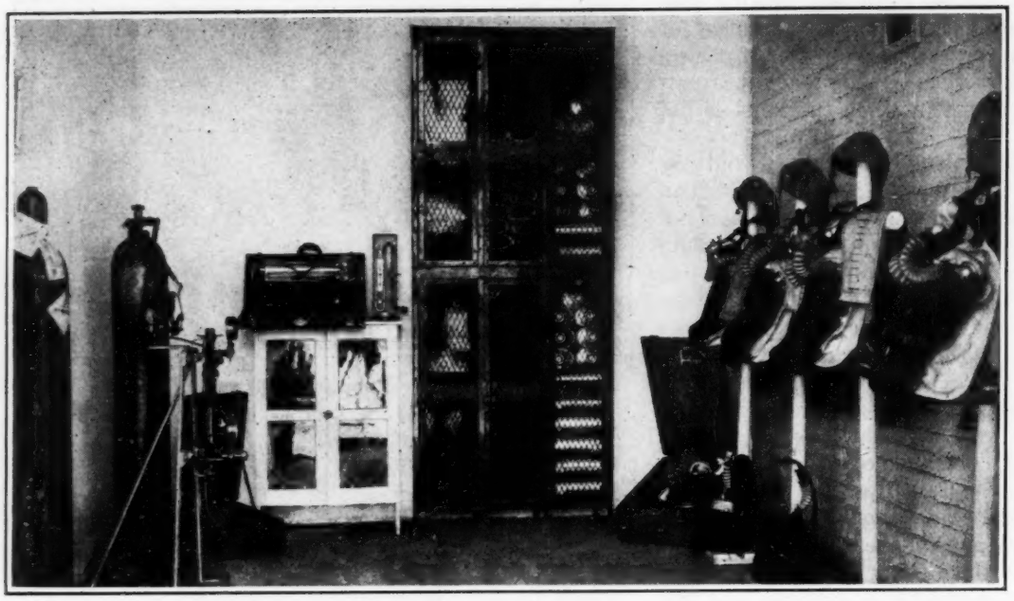
Then too, ingenuity and competition for business have resulted in the design of many labor-saving devices. One large company has made wonderful savings by better control of the direct-current distributing lines. The principle of the super-power system, that promises so much in national development, has been adapted to render more economical the operation of the power systems of individual companies. Circuits have been arranged and protected so that, during peak loads, power can be taken from several different substations. As a consequence most of the generating equipment operates continually at a high load factor. Furthermore, by the use of substations the generation of direct current is located close to the machinery to be operated so that there are no long power lines and defective return circuits.

Another company is now using large fan motors which can be slowed down, thus saving power during

Fan Motor Lowers Costs

Fans are large consumers of power. If the energy consumed by a 100-hp. fan motor could be cut in half during the night hours the power thus saved would be sufficient to run three 100-hp. hoist motors during the operating day. Such savings as these are not obvious but they can be made with little effort and expense.





Rescue Apparatus Pays Profits

When an accident occurs every minute means money and anxiety. Fire-fighting equipment when readily available may quickly return its investment. Dangers multiply and fires quickly spread when not combated immediately. Idle periods occasioned by accidents eat up the profits, for they usually occur when the market is good.

idle periods, nights and holidays. Where some of these motors have been installed the power costs during two-thirds of the twenty-four-hour day have been halved.

Storage batteries used on locomotives, cagers and coal cutters often bring about great savings. Yet the possibilities of this devopment are as yet but inadequately recognized. Batteries recharged at night do much to minimize the daily peak load, for which the consumer usually pays a fancy charge whether it be to his own power plant or the power company. Rotary converters which supply energy during the day to trolley locomotives, cutters, etc. are often used during the night to charge storage batteries. Where 110-volt batteries are used large savings of power are made by placing the battery in the circuit between one line wire and a neutral point on the rotary transformer bank.

Storage batteries are now frequently put on charge and given little or no further attention until morning. By means of ampere-hour meters with suitable contacts, the high charging rate is lowered at a predetermined time and finally terminated. When the last battery is fully charged the power-converting machine is shut down by a load control relay or a time clock.

The power loss resulting from poor bonding is not fully realized or appreciated. Most of the bonding work comes under the direct supervision of a mine foreman and consequently is often left undone. Electrical engineers are now endeavoring to overcome this evil by making the repair of the return circuit a part of their work whenever they install any new apparatus in the mine. Others are surmounting the difficulty by placing the substations so near the center of the loads that the feeder and return circuits are short, thus reducing the voltage drop.

Heretofore, lightning arresters have been used almost exclusively on power lines exposed to atmospheric lightning, but lately many new types of such apparatus have been developed and these have been applied where owing to grounds, short-circuits and switching operations, abnormal voltages are built up. The added protection thus afforded has often checked line disturbances which hitherto have greatly damaged electrical equipment.

Static condensers located where they can correct lagging power factor offer wonderful opportunities to increase the kilowatt capacity of transformers, power lines, switches and generators. Synchronous motor-generator sets once located where they could best correct the lagging power-factor of tipple and breaker drives can now be transferred to the mine where they can deliver full voltage to the mining machinery. Thus burnouts will be less frequent, power losses will be diminished and higher operating speeds attained.

Obviously, we are seeing revolutionary changes; factory methods are being adopted and these enable the operator to get out his product at minimum cost. Thus intensively performed mining will bring in a profit every working day.

Keep Open-Flame Lamp from Coal Mines

By L. C. Ilsley and M. W. von Bernewitz*

Several hundred thousand open lights are carried daily in coal mines of the United States, each lamp being a menace to light and property through fire or explosion. They have been responsible for many disasters in the past and will be again. Flame safety lamps have been available for over a hundred years, but during the last ten years safe and practical electric lamps have been perfected. These have eliminated many of the flame safety lamps and in a few mines have replaced open-flame lamps.

But there are still more than twice as many open lamps as electric lamps in our mines, and the open lamps should be discarded in favor of an approved type of electric lamp. There are several electric miners' lamps which have been approved by the Bureau of Mines for safety and efficiency which give a good light and are easily maintained and carried. Some flame safety lamps will always be used, but mostly for detecting gas, although they might be supplanted if some simple, reliable and cheap gas detector were developed.

An open light and gas combine to form a vicious hazard, and if any coal dust is present in the vicinity the consequences are multiplied many times. An open light and black blasting powder also constitute an explosion hazard, as has been vividly attested by several serious disasters.

*Electrical Engineer and Mining and Metallurgical Engineer, respectively, U. S. Bureau of Mines.

Give Loading Machine the Chance It Deserves

Every Mine Installing Machines Should Work Out a System of Operation—The One Presented Should Enable Six Machines to Produce 1,500 Tons Per Day from Twenty-Four Places.

By Charles Gottschalk
Mining Engineer, Evansville, Ind.

IN THE development and adoption of mechanical loading underground, the past year has been an important one for both mine operator and manufacturer. During the formative period, the pioneers are many, and not all can succeed. In the case of mechanical loading this has proved true of both the mine operator and the manufacturer. Fortunately, however, the net result of combined efforts has been a demonstration by several mine owners of their ability to install mechanical loaders and to obtain the entire output of their mines from these machines for periods exceeding a year of continuous operation.

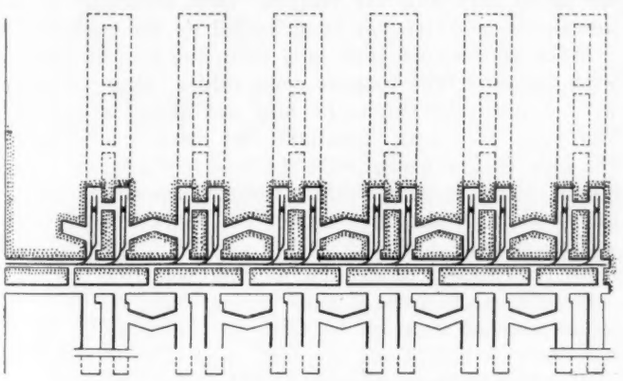


Fig. 1—Developing a Block of Rooms

Heavy lines denote territory developed by loader at the rate of 125 tons per day. This section is now ready for six machines allowing four rooms to each. The total capacity of this group of rooms should be 750 tons per day.

In the Indiana, Kentucky, and Illinois fields it appears that those operations that have made only conservative changes in the mode of mining followed have been more successful than those which made radical departures from proved methods of roof control. However, many enthusiasts hold to the idea that success with loading machines is dependent upon modified longwall mining. At the opposite extreme—and instances of its use are numerous—machines have been placed in the mines with little further preparation for their operation than would have been made had so many more laborers been added to the payroll. Needless to say that in such cases satisfactory results were lacking.

As most of the mechanical loaders installed in Kentucky, Illinois and Indiana during the past year had first to demonstrate sufficient capacity in straight room-and-pillar work to jutify their purchase, it is only logical to suppose that more satisfactory results would be obtained by modifying the transportation system than by altering the method of mining. To a certain extent pioneering could thus be made profitable as well as instructive. Only after the capacity of a loader under existing conditions has been determined can the most efficient scheme of transportation be devised.

Installation of improved mining and loading machines always requires the expenditure of appreciable sums of money. To make these investments pay dividends, the management must provide continuity of operation for such machinery. This sounds easy; unfortunately, however, failure to observe this fundamental principle has done more to disappoint investors in loaders than any other consideration.

In order to illustrate the thought in mind, a plan for the operation of mechanical loaders is shown in the accompanying sketches, Figs. 1, 2 and 3. A room section conforming to the standard dimensions adopted in a certain large producing field has been selected as a basis, and a layout suggested that will conform with the plans of a mine operated on the room-and-pillar system. This layout and the successive steps followed in the development of the block have been projected with especial consideration to the operating conditions and capacities of a gathering and loading machine provided with a swinging conveyor.

The development work connected with the room section here shown has been so planned that within a radius of approximately 100 ft. enough places will be provided to afford a capacity of 125 tons per machine every day, it being assumed that this is the average daily capacity of one mechanical loader.

When the room entries have been driven to their limit and the last pair of rooms extended as shown in Fig. 1, sufficient territory will have been developed so that each room entry will accommodate three loaders per side, or six in all, the rooms being of such width that four of them will furnish work for one loader.

The third step contemplates widening the room by taking three slabbing cuts off one side of each pillar. This operation has been timed so as to form the final stage of the work. It may be started from the inside, that is, on the retreat.

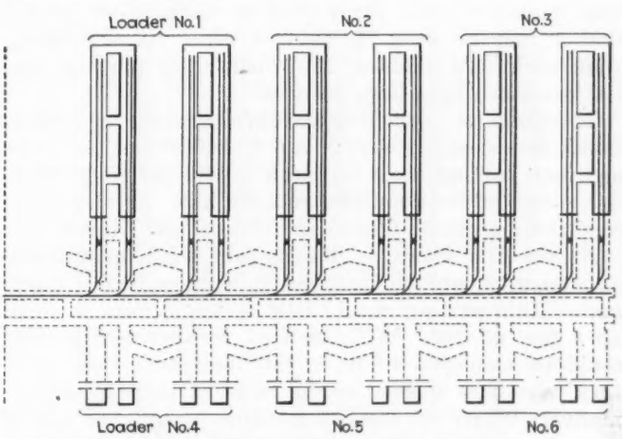


Fig. 2—Second Step in This Kind of Room Work

Heavy lines indicate mining done on regular room faces. All six loading machines start together and advance all twenty-four rooms at the same rate. The output during this stage should be 750 tons per day.

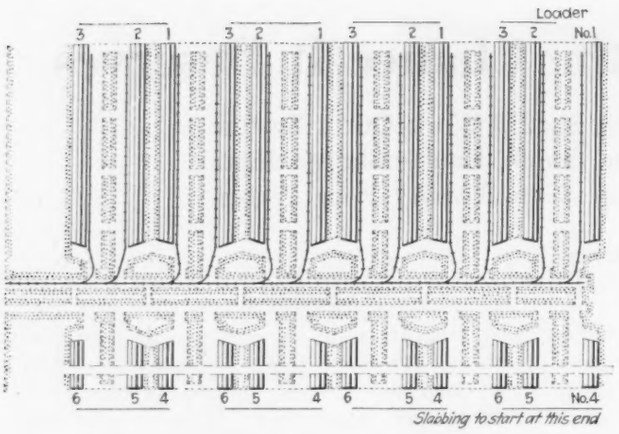


Fig. 3—Slabbing Finishes the Block

Solid lines indicate territory mined by slabbing. The six loading machines start simultaneously loading out three long slabbing cuts from each pillar. The maximum productive capacity is attained at this stage and the output should approximate 1,500 tons per day.

Up to this time, ample pillars have been left in place to insure against the possible development of a squeeze or creep. The capacity of a loader with a swinging conveyor on slab work is more than double that on ordinary face loading. Where development work is performed on the basis described, it is a weak roof indeed that would not permit of at least three slabbing cuts being taken in the short time required by such a machine to load out the coal produced.

It should be noted that the basic idea embodied in this plan has been to develop sufficient territory so that working places may be provided and the maximum capacity of loaders rendered available as each machine is put into service. The production curve for each stage of operation is, therefore, a straight line. Transportation also is simplified by this plan.

The method, as offered, should be a big improvement over systems now in use in many mines. The intention of the illustrations, however, is to impress on those interested in the operation of loading machines, that the big problem at the present time is that of affording the machines now on the market, the opportunity due them. To this end a planning department should be provided which should have the ability and authority to synchronize the various movements necessary for successful and economical operation of the machine. The plan suggested calls for a loading machine so flexible that it may be used for narrow work, room turning, wide work, and slabbing, for which latter purpose special machines have been designed.

The three accompanying sketches tell their own story. Conditions assumed were: A 6-ft. bed of coal, an average roof, inclination of bed such as will permit of turning rooms off both entries, and the like. In short, the conditions generally found in Indiana and Illinois.

As the first stage, or development work, progresses, a parting should be installed in each extended room neck. This parting should hold sufficient cars to clean up a face of coal. With such an arrangement a mule could be employed to move the individual cars after they were once spotted on the room partings by a locomotive. Where the loading machine is equipped with a swinging conveyor, the rooms may be provided advantageously with double tracks. The machine may thus load alternately first on one and then the other regardless of the position in which it may be working.

The Miner's Torch

What Rock in Coal May Do

THERE are several explanations for pieces of rock being found mixed with the coal which has been shot down at the working faces and ready to load into mine cars. It may have fallen from the roof, it may have originated from partings in the coal, or perhaps the machine mining was made in a soft bottom, etc. Miners do not always separate carefully the rock from the coal before loading the coal into cars at the working face, and the slate inspectors on the top house do not always discover this falling from grace, as it were, on the part of some of the miners. The slate pickers are never able to entirely clean the coal between the mine cars and the railroad cars especially if an inordinate quantity has been loaded by the miners.

Much of the rock that falls from the roof to mingle with the coal falls because some miner takes a chance with a prop; he thinks he may get along without it, and does, but with unsatisfactory results. Much of the rock that is loaded with the coal in violation of the spirit of the dockage rules is loaded because the miner knows that all the cars cannot be inspected and he is willing to take a chance at the penalty. Much of the slate that passes along the picking belt into railroad cars, does so because a slate picker finds it easier to let a piece of rock go by than to summon the effort necessary to lift it off the belt, especially if the boss picker has his back turned.

Some of the railroad cars loaded with dirty coal find their way to railroad coaling stations; a passenger engine coming along just as some of the dirty coal gets to the chute gets a tender full of coal and rock, perhaps mostly rock. Then, as the engine is approaching the maximum grade on the run the fireman finds that he cannot maintain the necessary steam pressure with the coal that he has, and the train gets off schedule. At the next junction point one of the passengers misses his connection, due to the lateness of the train. Many things happen to passengers who miss connections. Some of the consequences are amusing, others are tragic.

Perhaps a railroad car with more than its share of rock is delivered to a retail coal yard. The yard man having paid for the rock decides to pass the bad buy on to his customers. In the course of events some of the coal with rock is unloaded at a hospital coal bin. Firemen at hospitals are just average firemen; they are not able to keep steam pressures up to the maximum with fireboxes full of clinker. There are times when the lives of several patients may hinge on the temperature of the hospital wards. Pneumonia is always just around the corner following operations; an unlooked for drop in the temperature of the room, if not quickly noticed by the nurse in attendance, may mean life or death to such a patient.

Perhaps this impresses you mostly as a journey of the imagination. Your guess is correct; but if the men responsible for the rock that gets to the coal pile with the coal would use their imaginations more, such things would not happen.

Shale Dusting Now Spreading Rapidly in Illinois

Many Companies Follow Lead of "Old Ben"—Traveling Blower to Dust Ribs and Roof Comes Into Use—Valier Coal Co. Tries One-Process Pulverizer to Cut Costs

SOUTHERN Illinois, where are grouped some of the largest bituminous coal mines in the world, is seriously adopting shale dusting. The years of study and thought that have been devoted to the subject of stopping explosions and thus saving life and property by the use of shale dust is getting in its work at last. The mines of the Old Ben Coal Corporation, where the dusting system got its greatest impetus are now merely the center of what has become a widely radiating spread of the dust idea. The Chicago, Wilmington and Franklin Coal Co. at its two great Orient mines, the Peabody Coal Co. at mines 19 and 20, and the Valier Coal Co. at the Valier mine that Carl Scholz built, all are plunging into dusting with definite and comprehensive programs. Others are following. The region is gaseous and the coal dust dangerous. These dangers are to be materially lessened by pulverized shale.

For years the principle of rock-dust protection has been studied in the southern Illinois region, but the events of the last few months seem to have stung the territory into action. Perhaps the fact that in this country the three years 1918, 1919 and 1920 were comparatively free from dust explosions tended to lull Illinois as well as the rest of America into a lackadaisical attitude of mind toward shale dusting.

Only 169 men were killed in major explosions in those years. Much confidence came to be placed in water as a protecting agent against coal-dust ignition. Events of the immediate past, however, have upset this faith in water. The tremendous explosions since Jan. 1 in which nearly 400 lives have been lost and in which coal dust played its part, have helped in this awakening.

Perhaps the recent visit of the official delegation of the British Mines Department, which toured through Illinois, may have helped. Much was said during the tour concerning English rock dusting. Perhaps the studies which George S. Rice of the Bureau of Mines made in England a few months earlier may have added their bit. Naturally the conclusions reached within the year by other Bureau of Mines engineers favoring the use of rock dust in coal mines have had their effect. But Illinois is taking its swing toward rock dust principally because the results of its own investigations have finally convinced many operators that dusty, gaseous mines *must* be protected with incombustible dust.

Most of the Illinois investigations into the value of dust protection have been made since 1917 and by the Old Ben Coal Corporation under the direction of J. E. Jones, its safety engineer. It is now generally claimed among mining engineers in the Midwest that Jones has had more experience in rock dusting than any man in this country.

However, the mines of Illinois are not following every detail of the Old Ben plan of dust protection underground. That corporation has applied shale dust in its mines in four ways: In concentrated barriers containing one and a half to three tons of dust, in V-shaped troughs, piled on platforms elevated a few feet from the floor and spread on roof and ribs. It is roof-and-rib dusting which is now being introduced into many of the large mines of southern Illinois.

In order to spread shale dust on roof and ribs throughout the mines, an old device in shale dusting is now being once more introduced—the traveling blower. For more than a year Mr. Jones and his associates have worked to produce a machine that will do the work satisfactorily. All sorts of devices have been tried in an effort to get something that would distribute rock dust uniformly into every crevice and on top of every projection. Previously dust had been spread by hand with limited success. Eventually a machine was built which is now in its final stages. Its construction details hitherto have not been made public.

Meantime other interested engineers have been busy trying to conceive a traveling blower to serve the same purpose. Their problems have been many. Shale dust pulverized to a fineness of 250-mesh is difficult to handle. Loaded into a hopper feeding into a suction vent pipe, the material persistently packs in the feed line. Its weight, in the case of some Illinois shales, averages between 60 and 75 lb. per cubic foot. Various devices to overcome the difficulties of feed have progressed at least as far as the blueprint stage.

One is equipped with a piston agitator in the bottom of the hopper (Fig. 1). The piston is actuated by a short crank driven by a chain from one of the wheels of the truck so that the speed of the piston is deter-

THE ANTI-EXPLOSION CAMPAIGN IS WINNING

J. E. JONES, shale-dust expert, sees real progress now being made against mine explosions. Speaking of Franklin County and Illinois he says: "The outlook for increased safety against explosions is brighter than ever in the history of the county or the state, as is evidenced by a more thorough understanding of the hazard and the growing interest in the reduction of this hazard by both employer and employee. * * * The three principal factors required to produce a coal-dust explosion are an open light, an accumulation of gas and explosive coal dust. The first is removable by the installation of enclosed lights found permissible by the Bureau of Mines. The second can be minimized by proper ventilation and inspection, but this hazard will always exist in a gaseous mine. The third can be eliminated by neutralizing the coal dust with incombustible dust making a mixture that is non-explosive."

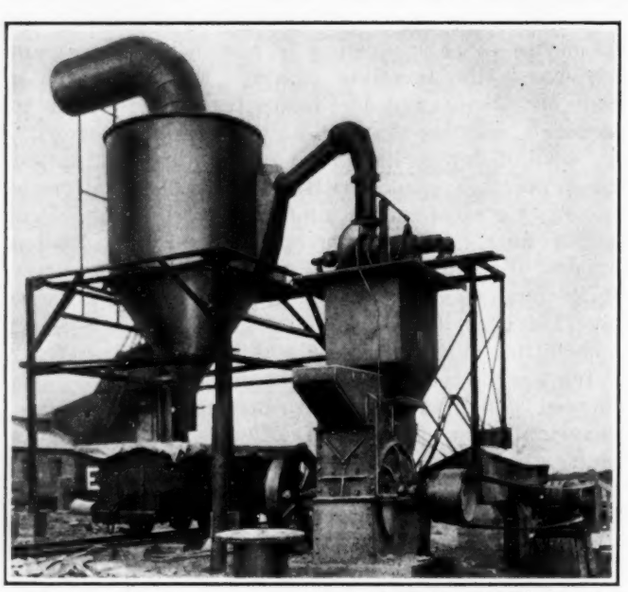
mined by the speed of the truck. This is calculated to feed dust to the blower in a volume varying with the rate of travel. Another is equipped with a belt type of feed to the fan, which also is designed to maintain a given ratio of dust volume to truck speed.

These dust spreaders are to be supplied with flexible nozzles of large diameter. An operator riding with the truck directs the flow of dust according to the immediate conditions. Such a truck, carrying several tons of dust and pulled by a locomotive can proceed at a low rate of speed throughout the entire mine making a uniform deposit of dust on roof and ribs in much less time and at much less cost that ever could have been possible by hand.

Careful studies of the several mines that are adopting stone dusting in Illinois are determining the exact quantities of dust to be applied in each case and are working out frequencies of application calculated to maintain given proportions of incombustible material to coal dust.

It is generally accepted that at least 55 per cent of shale dust must be added to the coal in the roadway to render it harmless. In some cases, higher percentages than this will be provided, running, probably, up to 70 per cent at the time of application. To secure such a proportion, it may be necessary to distribute as much as 10 lb. per lineal foot of 12-ft. haulage or airway or approximately 26 tons per mile. Most of the companies now adopting the dusting method expect to make one thorough and complete dusting of the mine every three months with more frequent application in main haulageways. Periodical dust analyses will determine a frequency of application that will maintain a safe proportion of shale to coal for each mine.

The most definite progress in dusting in southern Illinois, except the extensive work done at the Old Ben mines, has been made at the Valier mine of the Valier Coal Co., owned and operated by the Chicago, Burlington & Quincy Ry. This property, in the northwest edge of the great Franklin County field, has purchased shale dust for a year from the Old Ben preparation plant, and the Valier men have been spreading it by hand.



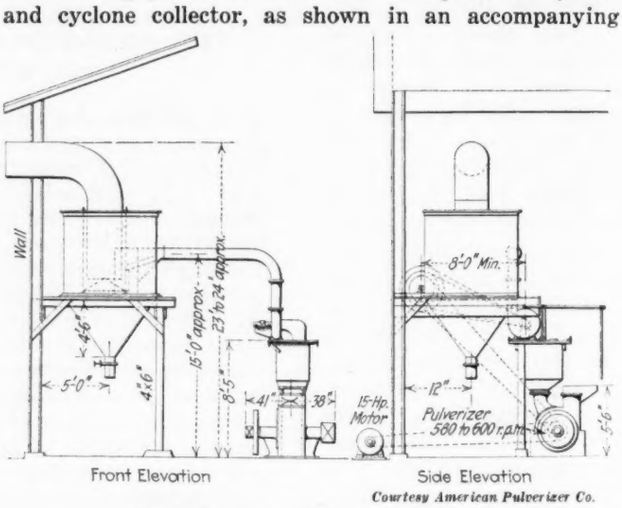
Courtesy American Pulverizer Co.

Pulverizer, Fan and Settling Chamber

The dust as fast as it is pulverized to the right degree is lifted by the draft and drops into the bin. Thus the course material is not protected by the fine but suffers all the violence of the pulverizing machinery.

Recently the Valier Coal Co. decided to do its own pulverizing, using shale from its own workings. Accordingly it installed a grinder which did not afford the proper fineness. It then set up and is now testing an American ring pulverizer which, for a month, has been producing between one and two tons of pulverized shale per hour, 85 per cent of it is 80-mesh fine and a considerable proportion finer than 200-mesh. One operator at the union top-work day rate of $6.59 has been running the pulverizer, and the cost of the dust, as computed by the company, is little more than $1 a ton so long as the pulverizer can get anywhere near continuous running time. This is about one fifth of the previous cost of shale dust to the Valier company.

This ring pulverizer with an air separation system and cyclone collector, as shown in an accompanying illustration, is installed at a point not far from the main shaft. Shale from the mine is hauled by pit car to the pulverizer, broken up into 6-in. chunks by sledges and fed into the hopper by hand by the lone operator. A 40-hp. motor, belt-connected, drives the pulverizer. The fineness of the output of the mill is controlled by opening a bypass valve and closing a deflection gate in the section elbow above the mill. The degree of draft thus created by a 2-hp. motor-driven suction fan determines the fineness of the dust to be delivered through the cyclone collector and discharge pipe into a waiting car lined with tarpaulin.



Courtesy American Pulverizer Co.

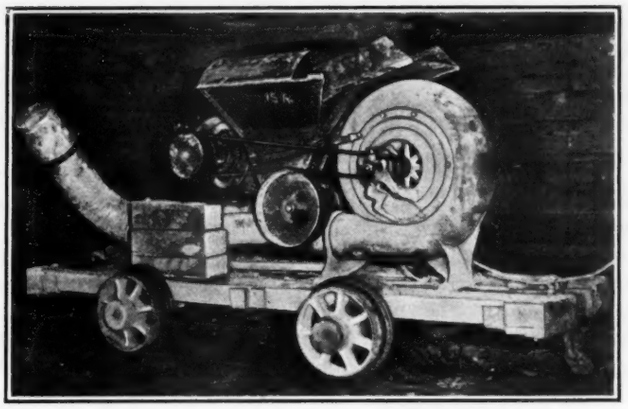
Elevation of a Pulverizing Plant

The cars covered with tarpaulin are run under the bin and receive their load. In this case only one machine is provided, the one unit serving for both crushing and powdering.

All "Old Ben" Dust Passes 150-Mesh Screen

The only other shale-dust producer in Illinois is the unit operated by the Old Ben corporation. This is a two-stage mill with a capacity of 40 tons of dust per day. Hammer crushers first break the shale into 1-in. cubes and a ball mill equipped with cloth screens and suction fan, grinds the cubes into very fine dust. This plant is at Old Ben No. 9 mine where the shale is considered to be well adapted for the purpose. The percentage of combustible in this shale is low indeed as shown by tests that have been made upon it by the Bureau of Mines. An analysis showed moisture, 1.29 per cent, carbonaceous and other volatile matter, 6.05 per cent, carbon dioxide, 0.48 per cent and ash, 92.18

This snail-like machine is rock-dusting roof, ribs and floor of the headings in an Old Ben Mine. The new machine on the same principle will have a double discharge and will completely dust the heading in one trip.



The machine illustrated is operated by two men, treats a heading completely in two operations at the rate of 2,000 to 3,000 lin.ft. per hour distributing 2 to 3 lb. per lineal foot and making the ash content of the mine dust about 65 per cent.

per cent. It comes from the mill all finer than 150 mesh, 97 per cent being 200 mesh and 92 per cent 255 mesh or finer.

Extreme fineness of shale dust for use on roof and ribs is essential in order to get a proper impregnation of the dangerous coal dust deposited there. The removal of such coal dust from mines is a practical impossibility, for the finest of it settles in the most inaccessible places and astonishingly small quantities of it will propagate an explosion. The extent of a dust explosion depends upon the supply of oxygen and not as might be thought, on the quantity of dust. Mr. Jones holds that only 6 or 8 oz. of fine coal dust per lineal foot of passageway is required to satisfy the oxygen per lineal foot, and that therefore, a mine could be exploded over and over again—possibly hundreds of times—merely by refilling it with air after each "blow." Such facts as these are now realized by engineers in Illinois and elsewhere, and the realization is tending to spread the shale-dust propaganda far and very effectively.

Mr. Jones, in speaking recently before an audience in New York at the meeting of the American Association for Labor Legislation on coal dust explosions and how to prevent them, traced the history of the shale-dust study that has been made in Illinois and described the "Old Ben" system of dusting. He declared that by general and uniform use of closed lights, proper ventilation and inspection of mines and the neutralizing of coal dust with incombustible dust, the dangers of mine explosions will be greatly reduced. The dust hazard, long so troublesome and perplexing, can be removed, he said. In Franklin County, he added, the protection against explosion has been extended to a point where 4,350 of the 12,855 underground men of that county are protected with shale dust and 1,925 with enclosed lights. These figures are expected to be enlarged considerably within the next few months.

A part of Mr. Jones' paper follows:

Table I—Fatalities From All Causes in Franklin County Coal Mines, 1904-1921

Cause	Number	Per Cent
Gas and coal-dust explosions	203	38.09
Haulage equipment	124	23.26
Roof face and rib falls	107	20.08
Hoisting and shafts	25	4.69
Powder ignition explosions and return to shots	22	4.13
Electricity	18	3.38
Railroad equipment	13	2.44
Falling persons and objects	8	1.50
Machinery and mining machines	7	1.31
Explosions and suffocation other than by mine gas or powder	6	1.12
Total	533	100.00

"The Franklin county coal field of Illinois is comparatively new. It was opened in 1904. It now has an annual capacity of nearly twenty million tons. The mines are gaseous, and the coal dust is very explosive. The fatality rate from 1904-1921 was nearly double that of the state for the same period. The difference in the rate was largely due to the fatalities which were the result of mine explosions.

Table II—Gas and Coal-Dust Explosions in Franklin County, 1904-1921

Cause	Explosions	Fatalities	Per Cent
Gas and coal dust, origin unknown	1	51	25.1
Gas and coal dust, naked-light ignition	4	99	48.8
Gas, naked-light ignition	10	18	8.8
Gas, mine-fire ignition	3	32	15.8
Gas, electric arc or naked-light ignition	1	1	0.5
Breathing apparatus, after explosion	2	2	1.0
Total	19	203	100.0
Number of fatalities caused by gas explosions which were propagated by coal dust			153
Number of fatalities caused by gas explosions which were slightly or not at at all propagated by coal dust			50

"The number of fatalities in Franklin county mines from all causes during this eighteen-year period was 533, of which 203 were caused by gas and coal-dust explosions. Table I gives data on fatalities from all causes. Table II shows that three times as many deaths were caused by coal-dust explosions as by gas explosions.

"In Franklin county the progress in preventing explosions has been most encouraging. The chief improvement has been a better understanding of the dangers of gas and a consequent greater respect for it. Formerly, naked lights were often used by fire bosses during their examination, and it was considered a great joke to frighten someone by igniting a pocket of gas. But this is past history in this county. Most of the men employed underground are now aware of the dangers and comply with the regulations made for their safety. One of the chief factors in reducing accidents has been the change from black powder to permissible explosives for blasting.

"How greatly the fatality rate in the county has been lowered from 1904 to 1922 is shown in Table III, in which the first nine-year period of eighteen years is compared with the last nine-year period. The average of the fatality ratings has been reduced to less than one-half those of the first nine-year period.

"On Thanksgiving night, Nov. 29, 1917, the Old Ben Coal Corporation, which now operates nine mines in Franklin county and three mines just across the line in Williamson county, experienced a disastrous gas and coal-dust explosion in Mine No. 11, Christopher, Ill.

Table III—Fatality Rate in Franklin County, Lower Now Than in Previous Decade

Period	Killed	Employed	Killed per 1,000 Employees	Tonnage	Killed per Million Tons
1904 to 1913	156	17,935	8.70	13,965,493	11.17
1913 to 1922	377	88,679	4.25	86,904,726	4.34

This mine is one of the most modern in the United States and was but four years old at the time of the explosion. The mine did not extend at any point any further than 4,000 ft. in any direction from the shaft bottom, and the ventilation was good. The methane content on the main returns has rarely reached 0.2 per cent.

An Open Door Fills High Spot with Gas

"A short circuit of the air current, due to a door being left open at a crosscut 400 ft. from the face of the main east entry, caused an accumulation of gas on top of an abrupt knoll near the face of this entry. This section of the mine was quite wet both inby and outby from this accumulation of gas; the roadways outby being a swamp 300 ft. long which the explosion was compelled to cross before it could extend into any other section of the mine. The percentage of coal dust was exceedingly small in this territory compared with that in the producing sections as the work done was development only.

"As the day was a holiday, only part of the night shift reported for work. Seventeen men were in the mine. One of the men, a pumpman, went to the main east entry to start an electric pump to remove the water from that section preparatory for the next day's work. His carbide naked light ignited the gas.

"The ensuing explosion dried the saturated coal dust in its immediate vecinity to such an extent that an explosion was propagated with intense violence and heat throughout the entire workings, wrecking the mine in every direction, especially close to and in both shafts, instantly killing all the men.

"Had this explosion occurred on the day shift with its 600 men underground, every man would have been killed, and Franklin county would have had the worst mining disaster, if not the worst industrial disaster, of the United States.

"Considering the large volume of air, the apparent absence of coal dust and the wet condition of the territory where this explosion originated, one can easily understand that a dust explosion is always imminent in a gassy mine and that it is futile to hope to prevent the propagation of an explosion by cleaning or sprinkling the mine workings.

"This experience caused the officials of the Old Ben Coal Corporation to lose the little faith they might have had in the theory of watering and cleaning to prevent coal-dust explosions.

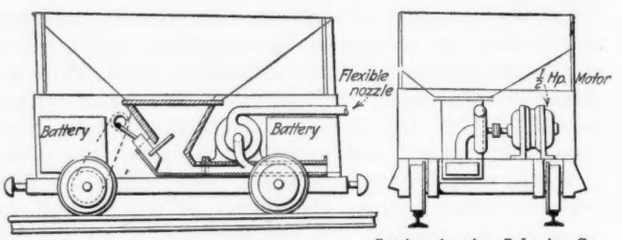
"The explosion also forcibly impressed them as to the hazard of naked lights, especially in a gaseous mine where the forgetfulness of one out of 600 employees might result in leaving a door open for considerable length of time or cause other derangement of the ventilation, permitting the accumulation of the explosive gas or the entrance of a miner with a naked light into a forbidden and gassy place.

"D. W. Buchanan, president of the company, decided from that time on to use enclosed lights and shale dust. When the mine where the explosion occurred resumed operations, it was on a strictly enclosed-light basis. This, however, was following a three months' strike by the miners against the enclosed lights. The company now has three mines in which only enclosed lights are allowed to enter night or day. In the other mines enclosed lights are used to the exclusion of all others from the quitting time of the day shift until starting time the following morning.

"The methods of preparing and placing shale dust were given much study. From a representative mine of the company samples of dust and air were collected by a Bureau of Mines engineer and these samples were sized and analyzed by the Bureau of Mines.

"Voluminous analyses showed that the most dangerous dust is laid along aircourses, at the working faces and on the roof and ribs of haulage roads and that the dust along the floor of the haulage roads is generally so high in ash that it is not nearly so hazardous as the other accumulations of coal dust.

"Five tons of coal were also sent to the Bureau of Mines' experimental mine from this representative mine to be ground into dust and subjected to experiment to determine its explosive properties. A commission of mining men from the state of Illinois and the Old Ben Coal Corporation were present at the Bureau's mine during part of the experiments. These tests showed in part, that Franklin county mine dust, containing 42.82 per cent of incombustible matter with no gas present, actually propagated an explosion, and that mine dust containing 58.66 per cent of incombustible matter with no gas present did not propagate an explosion.



Courtesy American Pulverizer Co.

Suggested Rock-Dust Distributor

One pair of wheels keeps the dust in the hopper loose so that the fan can draw in the dust and expel it.

The test also showed that dust containing 58.17 per cent of incombustible matter with 1.1 per cent methane present and dust containing 66.72 per cent incombustible matter with 2.2 per cent methane present both propagated explosions. It was demonstrated also in the experimental mine that the flame of an explosion could be successfully extinguished by rock dust that had been placed in Taffanel and concentrated barriers.

"The first problem in the rock dusting of the mines was to find material that would make an acceptable dust. Limestone dust was purchased, but this was found to be too coarse and to contain too much siliceous material. Surface road dust was also tried but it was found that a small quantity of moisture would cause this dust to cake and cease to act as a dust. The shale overlying the coal seam was analyzed and found to be exceptionally suitable for the purpose, hence the name, shale dust.

"Old Ben Mine No. 9 was chosen as the logical mine from which to obtain the shale and prepare the dust because of the cage-equipped material shaft and the adequate railroad connections for the field. A mill for the grinding of the shale into dust is installed at this mine. It has a maximum capacity of 40 tons of dust per day.

"Early in the mining experience of the county it was learned that the panel system of mining was that most favored for the localizing of explosions and mine fires. The panel system, where the panels are not connected to each other, gives a unit system of mining whereby each unit or panel is a territory by itself with unbroken coal pillars between it and all other units or panels, the only openings being those where the two entries connect with a pair of main headings for ventilation and haulage. The distance from one pair of panel openings to another pair is usually 500 ft.

"As the purpose of the shale-dust installation is to localize explosions, these two entries are the most important ones in which to install dust. An explosion cannot get into or out of a panel without passing through one of these two openings. Therefore, the shale dust is installed from the first room on each panel back to the entries from which the panel is turned and along these entries for 100 ft. in each direction, the trackless passages being provided with shale-dust troughs and the haulage roads having the roof and side walls coated with the shale dust. In addition to this protection each set of panels is protected by an 'Old Ben' concentrated barrier.

"Possibly of no less importance is the protection of all haulage roads and aircourses. Haulage roads are protected with the concentrated barrier at intervals of 500 ft. or less, the aircourse opposite the barrier having the trough installation. In addition to this protection the shale dust is now being mechanically applied by small portable high-speed fans to the roof and side walls of all the haulage entries and is being blown into aircourses to be carried into the mine and deposited, all this giving a high incombustible content from the shaft bottom to Room No. 1 of each panel."

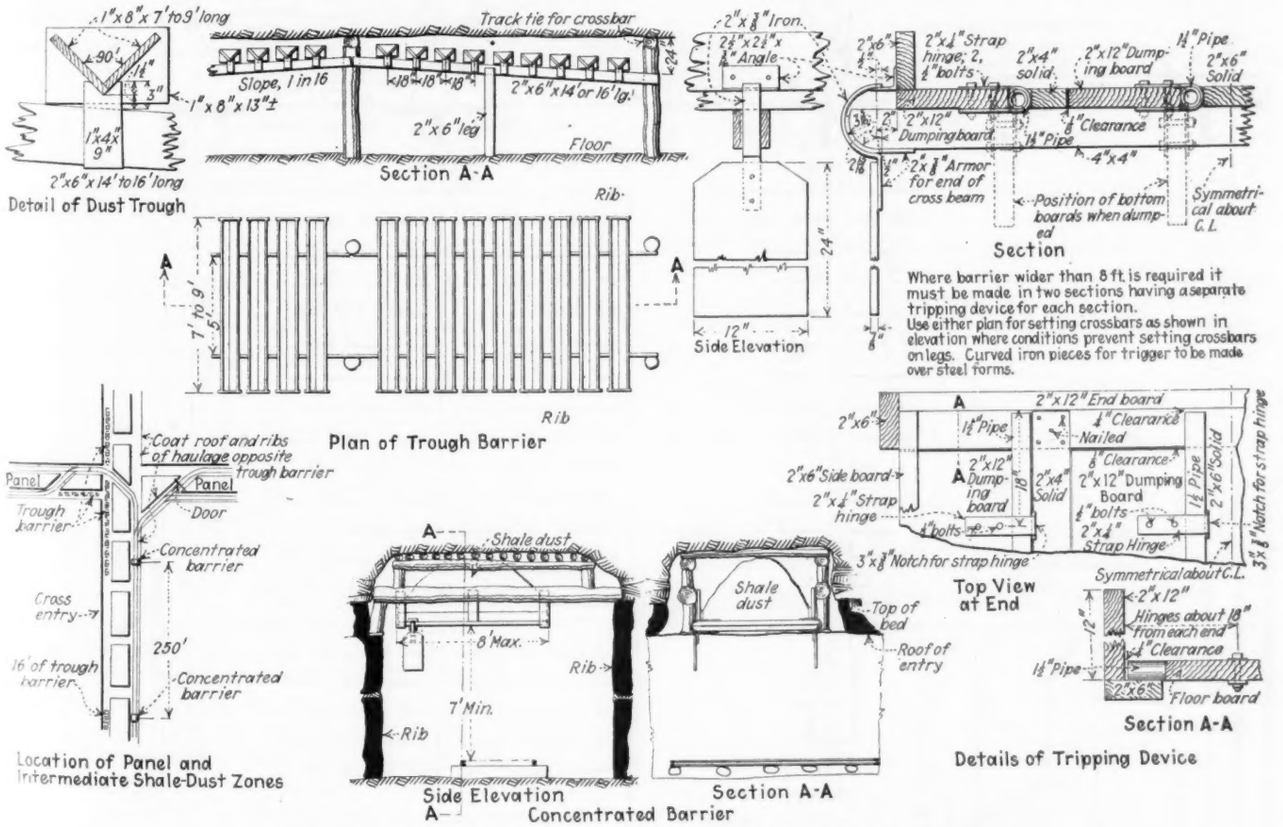
Mr. Jones in his address also described the "Old Ben" concentrated barrier, the V-shaped shale trough, the shale platform, and the distribution of dust on roof and ribs as follows:

"Old Ben" Concentrated Barrier

"The 'Old Ben' concentrated barrier has been designed with two purposes in view: (1) Placing in suspension a large quantity of the shale dust in as simple a manner as possible by the action of an explosive force, and (2) making certain that even though the device should be tripped accidentally or mischievously no part of it would fall a sufficient distance to injure a person who might be under it or endanger those on moving trips while approaching or passing under a barrier.

The barriers are built in roof cavities dug for that purpose and hold from one and one-half to three tons of dust. The bottom of the barrier is usually approximately in the same plane as the roof. The bottom, or floor, of the barrier is made of several, usually four to six, 2 x 12-in. or 2 x 14-in. planks, each plank being approximately 6 ft. long, dependent upon the width of the barrier.

Each of these planks is hinged on one edge, this hinged edge resting on the sides of the barrier. When free to move, the width of the plank hangs vertically. The floor, when the barrier is ready to be filled, is in a horizontal plane, the free-moving edge of all the planks being held in place by a beam which rests on two trigger vanes. Each of these vanes may be tripped from either direction, the displacing of either vane



Devices Used by Old Ben to Rain Powdered Rock on a Coal-Dust Flame

The troughs are used on roads that have no tracks. Concentrated barriers are installed on main haulageways. These latter are upset whenever the blast from either direction strikes a projecting vane. The dust in the troughs is not spoiled by moisture as readily as that in the roadways and is always ready for action. Besides its location above the roadway makes its distribution at the right time more certain and more intense. Prompt and positive release is secured by vane triggers.

causing the floor of the barrier to swing down about 10 in. and permitting the dust to flow down through the openings thus made in the floor. The flow of dust continues for ten to twenty seconds and gives a dense dust screen over the entire cross-sections of the passageway.

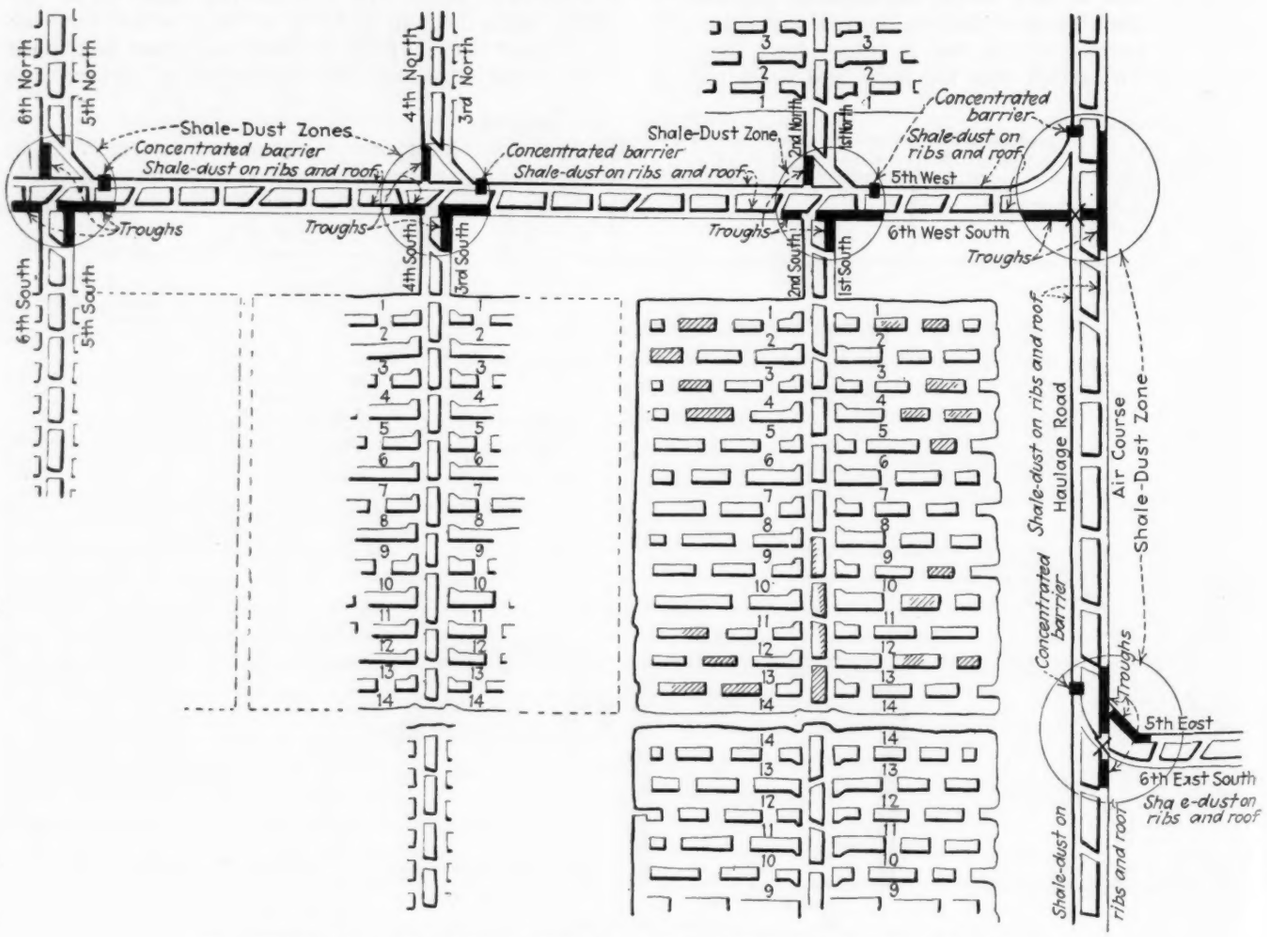
Dust Troughs Upset When Blast Occurs

The shale-dust trough is V-shaped and made from 1x8-in. lumber. It is from 5 to 8 ft. long, the length being dependent upon the width of the passageway. The troughs are filled with the dust, from 50 to 80 lb. being placed in each. They rest on two small notched pieces of wood which have been nailed to framework. The troughs are placed close to the roof yet have sufficient clearance to that a slight explosive force will upset them and discharge the dust.

A violent explosion would, of course, tear out the entire installation but with a slight force the trough will turn part way over in the direction of the force, retaining about one-third of its dust to be thrown in the opposite direction should a reaction of the explosion occur. As the troughs are installed close to the roof an explosion causes a dense dust screen to be formed in the entire cross-section of the passage way. Placed in this position they give the least obstruction to ventilation and to the travel of persons. Wherever concentrated barriers are installed on the haulage road shale-dust troughs are installed in all trackless passages of adjacent parallel entries to give a complete barricade of shale dust.

"On haulage roads in the shale-dust zones the dust has been thrown on the roof and ribs by hand, a large percentage of it falling to the floor. Because of the extreme fineness of the dust a large part of it is carried along the entry by the air current, settling on timbers, ribs, roof and bottom for long distances from where it is being spread. Recently the dust has been distributed successfully by small high-speed portable fans, the dust being fed into the intake of the fan and conducted by a hose of large diameter. By this means the dust has been deposited at any point desired. This method is so efficient and its cost so light that it bids fair to offset the necessity for the large number of concentrated barriers now in use in each mine.

Elevated platforms are usually made from broken and discarded ventilation doors and stand from 2 to 4 ft. above the floor. The principal purpose of these platforms is to supply additional shale dust in the event of an explosion and the secondary purpose is to give a supply of dust for refilling of troughs. When shale dust is stored on the mine floor much of it is wasted because the dust absorbs moisture from the fireclay and becomes mud, or is trampled into a solid mass that would prevent it from being thrown into suspension. The closer to the roof the dust is stored the greater the possibility that it will be thrown into suspension quickly in the event of an explosion."



How Old Ben Lays Out Mine in Panels and Guards Portals with Shale Dust Zones, Concentrated Barriers and Dust Troughs

The mouth of each panel is regarded as a point at which an explosion if generated must be stopped or it will involve other headings. Consequently it is arranged that if the flame of the explosion tries to leave by either main or back entry it will be promptly extinguished by a deluge of dust.

How to Get Big Output From Loading Machines

Plans That Enable Loaders to Keep Working Steadily but Which Do Not Involve Radical Reconstruction of Mine Workings or Abandonment of Room-and-Pillar Methods

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By THE use of mechanical loaders the labor expense of producing a ton of coal, now averaging about 70 per cent of the whole cost of production, may be cut down to such a degree as to lower the cost of the coal delivered on the railroad car under the tipple by as much as 40 to 50 per cent.

The advantages inherent in the use of mechanical loaders may be briefly summarized as follows: An increased tonnage per man per day; an increase in efficiency throughout the entire operation of mining as the result of a concentration of workings; an increased speed in undercutting because of a more definite cycle of operations; an increased tonnage per pound of explosives used; a decrease in haulage costs because of concentration of mining operations; a decrease in the quantity of timber used because the work progresses rapidly; a decrease in the cost of ventilation and drainage made possible by a reduction in the number of working places; an increased extraction of coal resulting from the more rapid advance of the work; a reduction in overhead expense rendered possible by a more uniform daily output and a decrease in the number of accidents sustained due to better supervision made possible by a concentration of working areas, which in turn results in lower insurance rates.

An Analysis of Conditions Is Necessary

Having decided to use these machines a careful analysis of the physical conditions in coal bed and workings should be made, for here, as in other industries, any improvement in methods or apparatus inevitably requires such modifications and changes as will enable the new device to function at maximum efficiency. This does not imply any drastic departure from methods proved suitable for hand loading. On the contrary, it would not be advisable to reconstruct the mine, for a settled policy can be reached only after long and careful study of local operating conditions. However, inasmuch as the change from old to new methods is made for the purpose of accomplishing certain specific results, so far as possible conditions should be modified to suit the new arrangement.

Attainment of steady production is largely dependent upon the adaptation of the machine to each particular problem. This application must necessarily be evolved by the operating personnel of each property. Realizing how greatly working conditions vary throughout the coal-producing fields and the impossibility of formulating any set rule of operations applicable to all districts, the following fundamental suggestions covering mechanical loading are offered.

The generally accepted plan of coal development throughout the United States is some form of double-entry room-and-pillar system. Although this plan is employed in approximately 98 per cent of the producing mines of the country, the variations and modifications introduced are innumerable. As longwall mining was originated for use in thin beds, it has not been necessary to apply it in this country, except in a few instances.

The simple room-and-pillar system, either in panels or otherwise, and either advancing or retreating, together with hundreds of variations employed for recovering the pillars is well adapted to the extraction of coal so long as such a comparatively slow method as hand loading is adopted. Mechanical loading makes it possible to increase greatly the speed of mining. A modification of the present methods, without drastic departure from the general plan, will meet the physical conditions encounterd, while at the same time it allows the machine to operate at maximum efficiency.

Underground transportation is an important factor in the cost of coal. Without proper equipment, coal cannot be economically gathered and delivered to the surface. Similarly, without proper track arrangements the time lost in car shifting may readily absorb the entire margin of profit. Consequently a few suggestions concerning track maintenance and equipment with particular reference to their relation to mechanical loading will not be inappropriate. Favorable grades and a firm, well drained track are primary requisites of any economical haulage system. Rail of adequate weight to carry the expected load should be permanently laid on all main haulways. It is false economy, regardless of its first cost, to install a rail too light to carry the maximum load. Although local conditions govern the gage of mine tracks, it is well known that the wider the gage the greater will be the stability of the rolling stock. In order to avoid derailments and other accidents, the track should be constantly maintained to gage and in alignment.

Tie sizes are governed by rail weights and track gage. Ties should be selected, however, to give the minimum maintenance cost. For track that must be

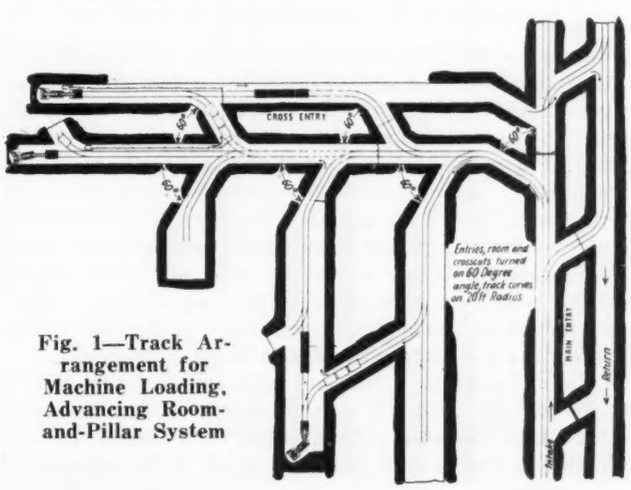


Fig. 1—Track Arrangement for Machine Loading, Advancing Room-and-Pillar System

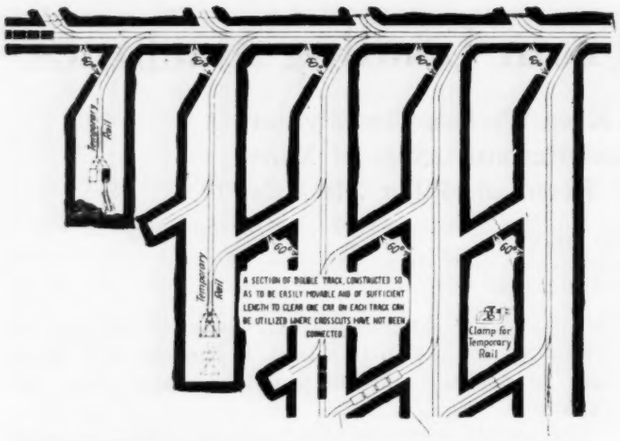


Fig. 2—Trackage System for an Advancing Machine-Loading Panel

This shows how the tracks may be utilized to afford storage for both empty and loaded mine cars. All cross cuts and rooms are turned at a 60 deg. angle.

frequently moved, steel ties should be employed. The additional headroom afforded by their use and the ease with which sections of such track may be moved or replaced well warrants the first cost of this equipment. Track curves should be laid on standard radii. To promote smooth transportation, as well as for easy movement of loading machines, the radii of curves should be more ample than are usually found in average practice. Adoption of a standard curve with a minimum radius of 20 ft. will be beneficial.

Switches, frogs, guards and curved rails in general should be standardized, and whether made up in the shops or purchased, should be delivered underground ready to put in place. Where electric haulage is used, the track should be carefully bonded. Trolley-wire supports and insulators should be standardized, thus reducing power losses. Local conditions dictate the size of mine cars that may be used. As a general rule, however, the initial investment necessary for a large size of car is more than compensated by lower cost of maintenance and an increase in the tonnage movement. The possibility of reducing frictional losses by the utilization of anti-friction bearings is well recognized throughout the industry. The weight, size and type of locomotives to be used is governed by local conditions, gradients, size of trips and length of haul. All rolling stock, but particularly locomotives, should be systemmatically inspected and repaired.

Little Changes That Make Loading Easy

So much for the general principles of mining and transportation. An analysis of a few arrangements and systems that have proved successful with machine loading will now be attempted. In Fig. 1 is shown the plan of a mine section during the early stages of development. All cross-entries, room necks and crosscuts are shown turned on angles of 60 deg. This promotes the easy loading of coal from room necks and crosscuts, facilitates the laying of curves on a minimum radius of 20 ft., and permits the easy starting of heavy trips. All points on chain pillars and room necks near track curves are slabbed sufficiently to allow clearance.

The advancing, main and back entries are shown connected by crosscuts at a point near the main cross entry thus forming a local empty and loaded storage track. A run-around is also utilized in the advancing entries to provide similar storage. The same system is followed in driving rooms by placing track in room crosscuts. In narrow work in the room-and-pillar system the tonnage output per loading machine increases inversely with the time lost in changing cars; that is, it decreases as the distance from the nearest siding is lessened.

Fig. 2 shows a suggested track arrangement designed for machine loading, and the manner in which these tracks may be utilized for mine-car storage. In this plan, all room necks and crosscuts in the panel are turned on angles of 60 deg., and all track curves are of 20-ft. radius. Four rooms are shown with crosscut track connections designed so as to permit the greatest flexibility in transportation facilities.

Crosscut Track Moved as Work Advances

As rooms are advanced and crosscuts connected, the track is removed from the last crosscut and replaced in the new one. This provides car storage at a point close to machine operation. A double-track arrangement so designed as to be easily removable and of sufficient length to clear one car on each track may be used in wide entry and room work to provide a car storage at the machine.

This section of track should be rigidly constructed so that by attaching a chain to it and to the loading machine the entire "Y" may be moved forward in the room or entry by the machine. In order to advance this section as required, temporary rails are joined to the permanent track on one end and to the "Y"-section on the other by means of quick-acting clamps designed for this purpose. A detail of these clamps is also shown in this figure. By the use of this simple track arrangement the time necessary for changing cars at the machine can be materially reduced.

Fig. 3 shows a suggested modified retreating panel-and-wall system of mining for use with loading machines. In mining a block of coal containing, say, 40 acres, the thickness of the cover, the condition of the floor and roof, as well as the character of the coal itself, may demand extraction by some method that will allow one-third to be taken on the advance and two-thirds on the retreat. Rooms may be driven on 72-ft. centers with a width of 24 ft. and pillars then pulled; or, rooms may be driven to their limit on 72-ft. centers with a width of 12 ft., two slabbing cuts taken for the entire length of each room, and pillaring operations then commenced. In either case the weight per square foot remains the same at the completion of first extraction.

However, when the roadways are driven only 12 ft. wide, they are no longer like rooms but more closely resemble single entries. In many mines they need no timber and when they are completed the rib on one side can be treated as a longwall face, thus permitting the mechanical loader to be operated for the entire length of the room. In consequence, it can handle a large tonnage, and the transportation units are enabled to work under the most favorable conditions. The same principle can be applied to mines where, owing to squeezes and creeps, it has not been found possible to draw the pillars satisfactorily. The pillars can be slabbed till a crushing strain develops. The rest of the pillar can be left. In this instance, however, the distance between room centers may be increased, the original room widths may be narrowed and a number of slabbing cuts may be

taken throughout the entire length of the panel before abandonment is necessary.

This application is shown in detail in Fig. 3, as a modified retreating panel of any length and width, developed from double main and cross entries. All narrow work is turned on angles of 60 deg. and the minimum radius of the track curves is 20 ft.

Ventilation as indicated in this plan consists of a separate split for each panel. This is taken from the intake through the main cross entries and through rooms, where regulators may be installed. The air is next conducted through the back cross entry to the main return which is overcast at cross-entry intersections. In driving the narrow rooms through the panel before connections are made, portable blowers and flexible tubing may be utilized to furnished air to the faces.

Narrow rooms, Nos. 1, 2, 3 and 4, are shown developing. This work is prosecuted from the cross entry which has a parting of adequate length to accommodate narrow-work switching. These rooms, however, are driven of sufficient width to permit a movable double-track "Y" to be used at the machine as shown in Fig. 2. Room No. 5 is shown connected through and with the first wall cut practically cleaned up. A loader with gathering head parallel to the cut delivers coal to a large trip of cars, while the mining machine is making its second cut on that portion of the wall that has been uncovered by the loader.

Room No. 6 shows the second wall, or slabbing cut, being loaded out and the third wall cut being prepared for drilling and shooting. Room No. 7 is operating on the sixth cut. Solid lines indicate the present position of the track, and dotted lines indicate its former positions. As shown, the tracks are moved over toward the rib after each two slabs have been loaded out.

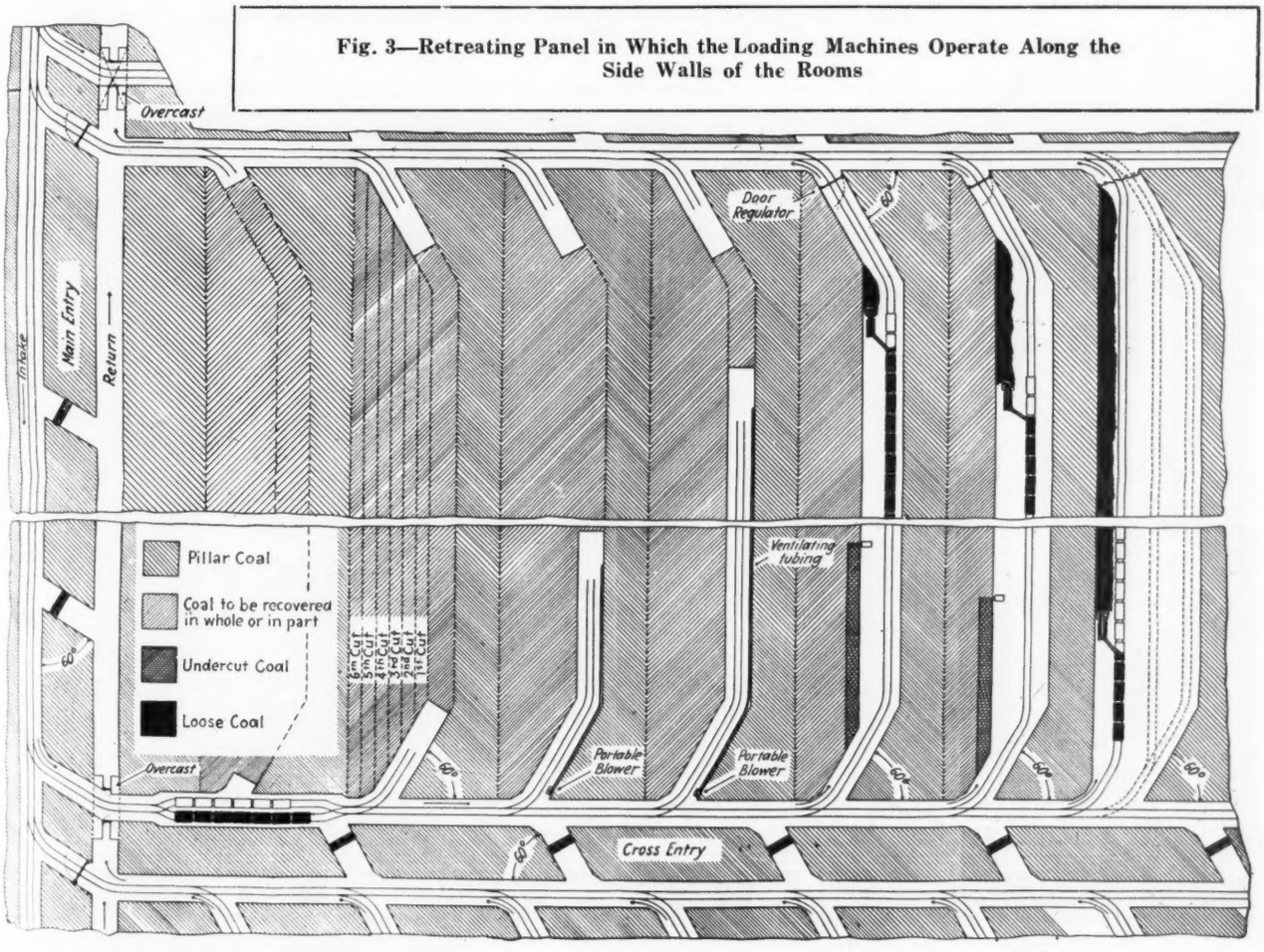
Slabbing Cuts Facilitate Rapid Loading

It is easy to see how this method facilitates the problem of transportation. At each cut empty cars are loaded in a continuous trip without any delay. They are hauled out on one side of the panel, and a second trip is brought in from the other side. The delay between trips, however, is insignificant, for the second trip may be standing ready to replace that which has been loaded.

A continuous movement of empty cars past the faces can be arranged in operations of this character. By this means the time lost in car or trip changing may be reduced to a minimum. That the reader may be enabled to compare the tonnages ordinarily obtained by hand methods with those obtained by this system, it may be said that where 6-ft. cuts were made in 6-ft. coal 800 tons were loaded by machine in a single eight-hour shift. Where a system of this kind is applied to operations where the total extraction of the coal is not customary, an uninterrupted car movement can be obtained. In such cases the coal can be mined at an extremely low cost.

Fig. 4 shows a room-and-pillar method suitable to the operation of loading machines, the rooms and the pillars both being worked advancing. This system is suited to thick beds such as are found in the West. The section of mine to be operated in this manner is developed by main and back entries which are used as intake and return aircourses respectively.

Fig. 3—Retreating Panel in Which the Loading Machines Operate Along the Side Walls of the Rooms



From these are turned pairs of right and left cross entries carrying air splits. All cross entries, room necks and room crosscuts are turned at 60 deg., and the track curves are laid to standard radii. From the main cross entry, rooms are driven to their limit on centers the distance between which is determined by local conditions. Room tracks are connected through the crosscuts nearest the working faces giving maximum flexibility of transportation.

A loading machine is shown in operation in the last crosscut of room No. 6, utilizing for the storage of empty cars that portion of track extending past this crosscut. The track laid in the nearest crosscut outby forms a storage place for loaded cars. Another loader is shown operating in the face of Room No. 5, using the last crosscut for empty storage and the one nearest to it for loaded cars. In both instances, incoming empty trips as well as outgoing loads, can be delivered to, or pulled from, the storage tracks by the main-haulage locomotives. The cars can be changed at the loading machine by a lighter switching locomotive.

As the distance to be covered in shifting both loaded and empty cars is reduced, the mechanical loader can deliver a maximum tonnage per room per minute. Where the condition of the roof is unfavorable, the distance between room crosscuts should be made such that pillars may be drawn by the usual method of cutting a crosscut near the end of the room pillar and then reducing the small detached pillar thus formed by cutting toward the inby edge of that pillar until it is reduced to the required thickness. The stump thus formed may be either left standing or drawn by hand. The pillar ends may be arranged to conform to the usual saw-tooth fracture line. However, with favorable roof and floor conditions the plan shown probably will give satisfactory results.

When the first room has been completed and the last crosscut in it has been driven, slab cuts successively may be taken beyond the room and crosscut into the barrier pillar protecting the next cross entry till the pillar has been reduced enough to bring it to the thickness required. An example of this method of removing the first portion of the pillar is shown between rooms No. 4 and 5.

When pillaring has been started in the manner just described, the undercutters take slabbing cuts on the retreating side of the last crosscut until a sufficient area has been extracted to permit of caving the roof. Both cutting and loading machines may be protected by a break line of props wherever local conditions demand such protection.

Continuous Break Line May be Established

Loading tracks are moved forward after every second retreating cut. New props are then set, and the old break-line props pulled. After a sufficient distance has been gained, a break line, presenting in effect a continuous face of pillar cuts, may be established.

By this means the undercutters are afforded cuts two or three times longer than in room faces. By properly arranging the cycles of operation the work may be performed with maximum efficiency, as little time is lost in

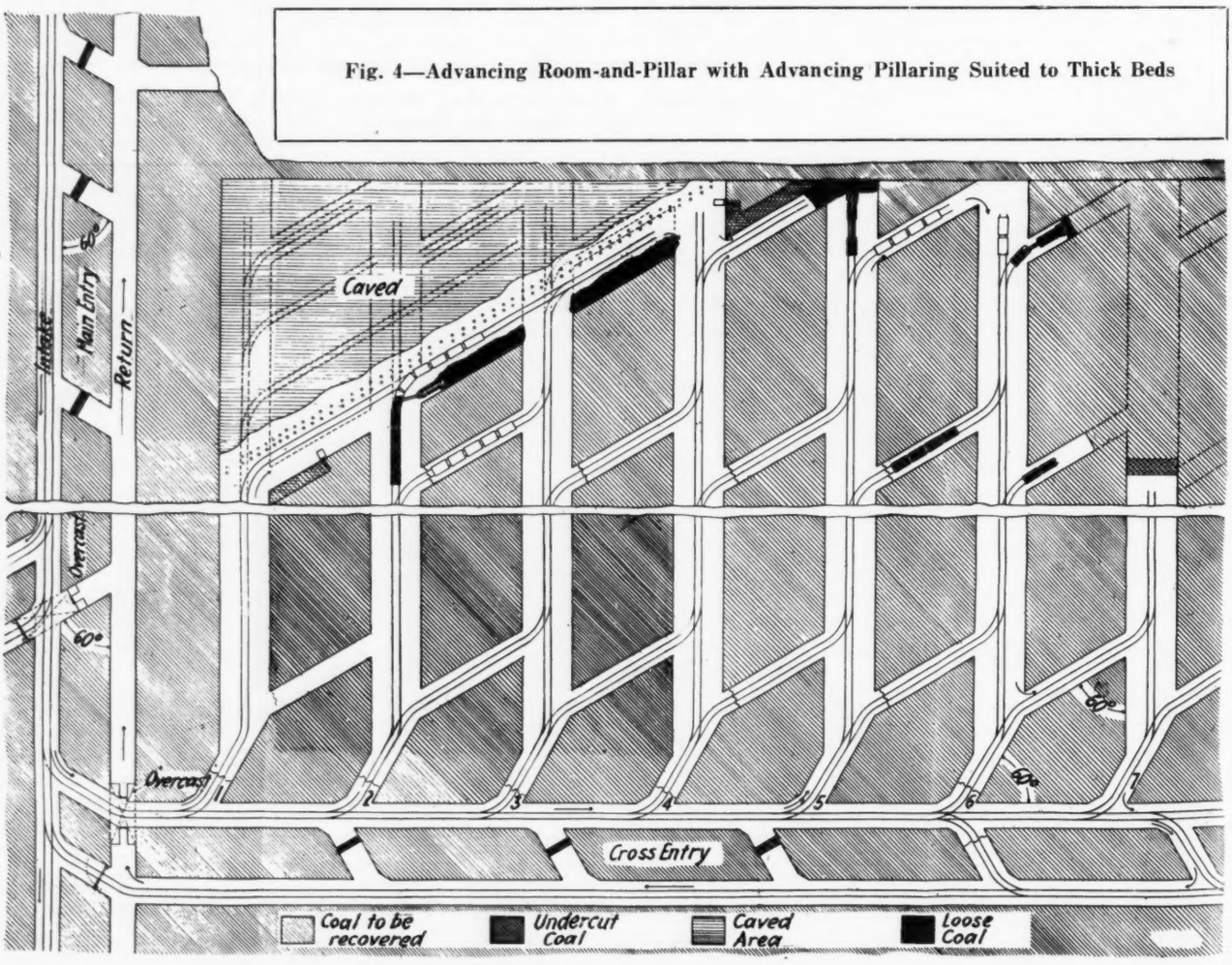


Fig. 4—Advancing Room-and-Pillar with Advancing Pillaring Suited to Thick Beds

moving from face to face. The mechanical loader operating with its gathering head parallel to the cut, moves into position at one end of the face and continues loading throughout the entire length of the cut. Connecting the face track with the room track will allow the loader to fill an entire trip without interruption. As the time consumed in changing trips should not be materially greater than that employed in changing single cars, it is obvious that the total operating time of the machine will be greatly increased.

Though this method of operation is based primarily on the standard room-and-pillar system of mining by the introduction of a slight variation from usual custom, a condition is secured that meets the physical characteristics of the deposit and at the same time allows the loading machine to operate at maximum efficiency.

Fig. 5 shows a suggestion for a retreating panel system of mining, adapted to machine loading. Development is made from headings by single entries driven at an angle. This plan is suited to transportation from the faces by either cars or conveyors. This system may be adopted with any standard or modified entry system of development. The size and shape of panel, and the angle at which the single entries are turned are governed by local conditions.

In this plan is shown a double main and cross entry for haulage and ventilation. With the exception of the single entry developments off the cross heading, which are turned at 45 deg., all openings are turned at an angle of 60 deg., and all track curves are laid on radii at 20 ft. Here again the main and back cross headings are shown connected through the crosscuts by a track arrangement that forms loaded and empty storage.

The entries are driven on such centers as to afford the greatest possible length of retreating face allowable under local working conditions. These entries are driven of sufficient width to permit of the use of the two-car, double-track "Y." Ventilation is supplied by portable blowers placed at the main cross heading, which supply air to the face through tubing or ventilating pipe.

When the single entries have been driven through to the panel boundary, cuts are taken on each side of the connection, to give the angle at which faces are to be carried during retreat. The method of timbering and spacing of props at the faces, together with the system of caving and the maintenance of the break-line, may be determined according to local operating conditions. In this instance single entries are shown turned on an angle of 45 deg. from the main heading on approximately 166-ft. centers; or, at points in the main heading about 260 ft. apart. This gives a pillar thickness of 154-ft. Retreating faces are shown at an angle of 45 degrees to the angled entry, or 90 deg. to the main- and cross-entry development.

Saw-Tooth Pillar Point Yields Big Tonnage

Maintaining the saw-tooth arrangement on an angle of 45 deg. from the single entry, gives a 100-ft. face on each side of the retreating block. At this angle, faces aggregating 200-ft. in length are obtained from a block 166 ft. wide. Assuming that one full cut 6 ft. deep

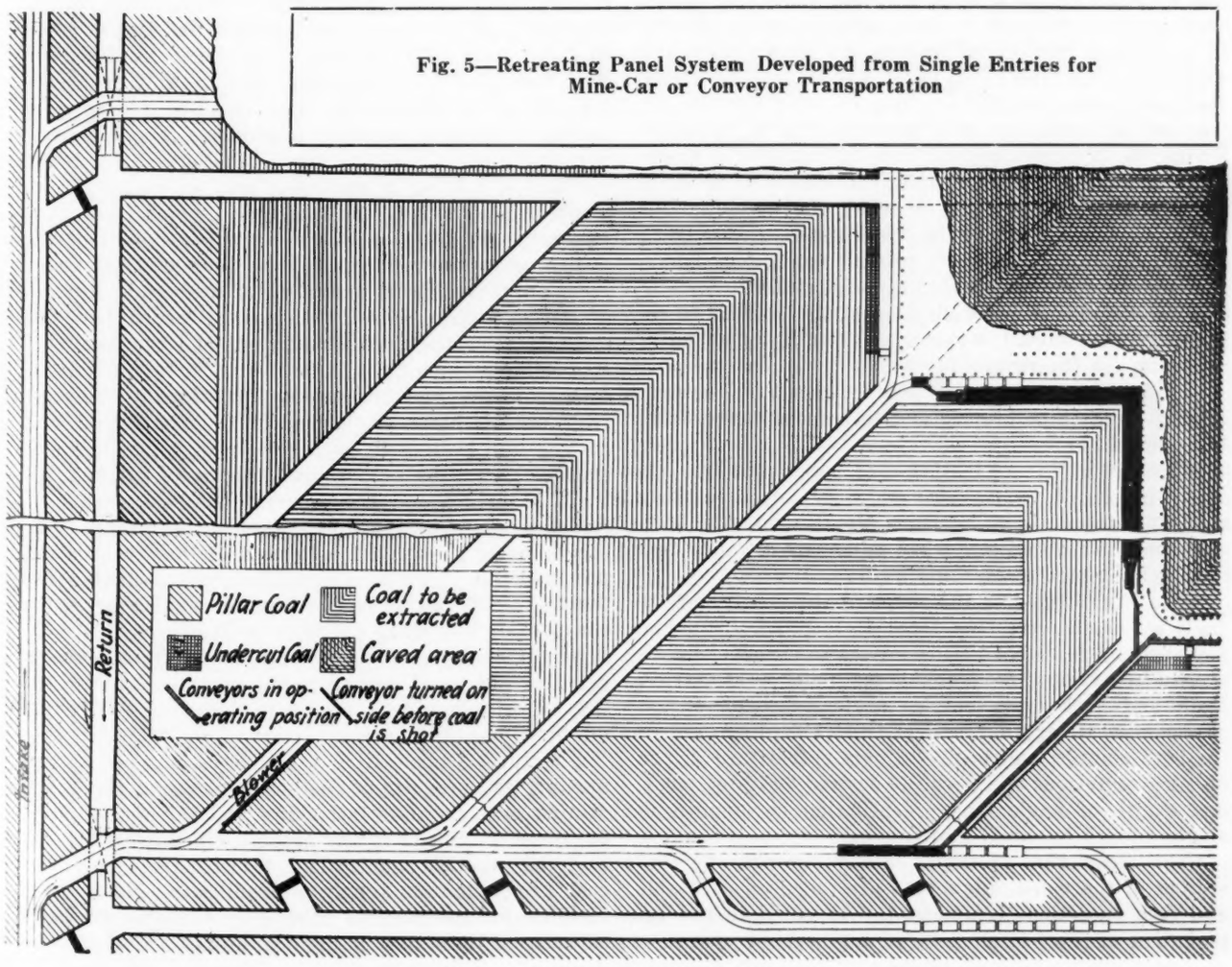


Fig. 5—Retreating Panel System Developed from Single Entries for Mine-Car or Conveyor Transportation

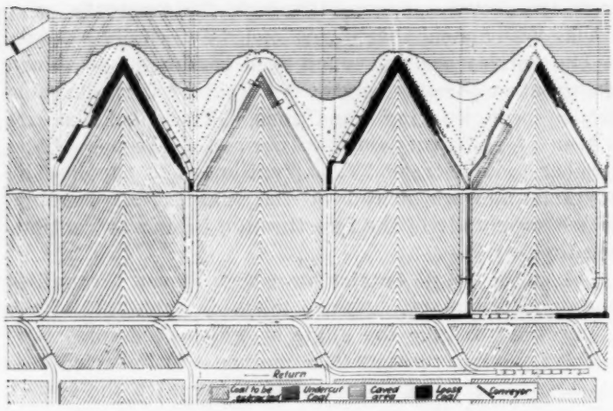


Fig. 6—Panel Developed by Modified V-System

This plan is adapted not only to loading machines but to either mine-car or conveyor haulage. High-output, low-cost mines in the future will doubtless use conveyors.

is made on each face per day, in a 6-ft. bed, the block would produce 266 tons. This operating concentration, made possible by a slight variation from the practice customary in panel work, greatly increases the speed with which the coal is extracted and enables the mine to be operated efficiently. Although this system has been advocated recently as a means of transporting coal from the faces by conveyors, it is well adapted, where physical conditions will permit, to mine-car haulage.

Fig. 5 shows a single entry with its tributary faces operated by mine-car haulage and another operated by face conveyors with a main conveyor extending to the heading where the coal is discharged into trips of cars. In both cases mechanical loaders are shown operating with their gathering heads parallel to the cut, and their discharge conveyors filling a trip of mine cars in one case and delivering coal to a face conveyor in the other. By the use of large trips the time of changing is materially decreased. When a sufficient length of track is not available at the face, or when the necessity for timbering will not permit the width necessary for track and car clearance, conveyors provide continuous transportation to headings where uninterrupted trip loading may be effected. By the adoption of this method to retreating panel work the loader is given an opportunity to accomplish the results for which it was designed.

Fig. 6 shows a suggested modified panel, "V"-system adapted to machine loading and to transportation from faces by either cars or conveyors. This is a further modification of the retreating-type panel, and was recently presented to the coal industry as particularly applicable to conveyor haulage. Its advantages, however, may be realized also when mine cars are used and it is well adapted to machine loading.

As in Fig. 5 the size and shape of the panel, and the angle at which retreating faces are carried, should be governed by local conditions. As here shown the V-system is developed from double main and cross entries. Main and back cross entries are connected through crosscuts by an arrangement of track affording storage for both empties and loads. Single entries are driven on such centers as will give the desired width of block, and length of angle face. Ventilation is supplied to single entries by small blowers.

Upon completion of single entries through the first section of the panel, angle cuts are taken on each side and face operations commenced. As noted in the explanation of Fig. 5, all detailed methods of operation such as timbering, caving, establishing a break-line, etc., can be adapted from local practice.

The V-system, as illustrated in Fig. 6, is operating on 60-deg. pillar points, giving 120-ft. faces at an angle of 30-deg. to the single entries, which are driven on 132-ft. centers. This gives a double face, each face being 120 ft. long, for a 120-ft. pillar width. Thus the length of the angle face is twice as great as that of a straight face across the same pillar. One 6-ft. cut per day, in coal 6 ft. thick, will yield 160 tons per face, or 320 tons per section.

In Fig. 6, section 1 shows in detail the method of operation for mine-car transportation. The trackage arrangement is shown in solid lines for its present location, and broken lines indicate its former position. This particular section is shown with the track moving forward upon completion of two face cuts. This distance will, however, depend upon roof conditions.

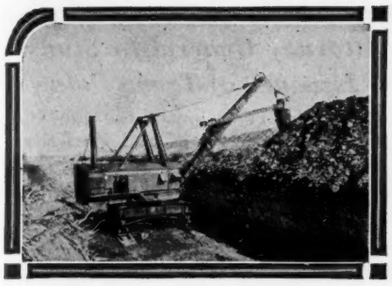
Lowest Cost Can Be Attained with Conveyors

Section 2 shows how the cutting machine is operated. Portions of the track are in this case moved up after each cut. Section 4 is designed for complete conveyor transportation, and shows a cutting machine operating on one side and a mechanical loader on the other. Entries bounding this section are equipped with conveyors from angle faces to main entry, where mine-car trips are loaded. It is not unreasonable to expect the large-tonnage, low-cost mines of the future to be completely equipped with conveyors.

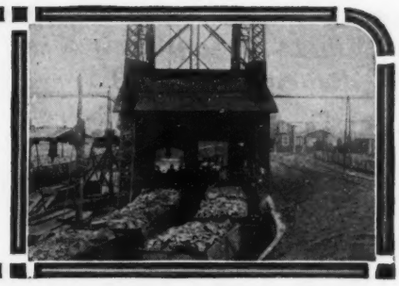
Face conveyors are shown built in sections. These may be turned on edge with their bottom plates toward the cut and the flight-face against the props before shots are fired. This is done to reduce the roof span in tender sections to a minimum, as only 8 ft. is needed between props and the new face to allow clearance for conveyors serving loading machines. The clearance between props and loading faces, in all operations where mechanical loading is employed, may be materially increased on account of the speed with which faces move forward.

This progress will result in an increased extraction from any given area, and allow a temporary increase of the roof span needed. As coal is loaded from the space between the conveyor sections and the face, each succeeding section as it is uncovered is turned to running poistion, and the tonnage continually delivered from the machines as they advance. The sequence of cutting and loading in each section of a panel of this character, may be so arranged that as a cut is taken the face drilled and shot on one side, the mechanical loader can be cleaning up the coal on the other. This can be made possible by a concentration of ventilation, provided state laws do not prohibit such practice. The tonnage delivered to the haulage locomotive or to the conveyor on any entry can thus be kept fairly constant.

No great departure has been made from accepted principles of panel mining in the systems outlined, but the opportunity for a record performance of loading machines has been increased many-fold. The outstanding features embodied in the illustrations are so elementary as to require no further emphasis or repetition. Mining men are daily attacking and solving problems far more difficult than any proposed in this article. In fact the practical application of mechanical loaders to coal production is simply a modification of present methods for the purpose of making available the large capacity of these new mechanical units.



News Of the Industry



Sees Co-operative Marketing of Coal as Relief from Cutthroat Competition

Merger Trend Believed to Foreshadow Further Move to Avert Recurrence of Distressing Conditions of 1914—Initiative Left to the Industry —Association Control Now a Pressing Problem.

By Paul Wooton
Washington Correspondent of *Coal Age*

Along with the consideration of co-operative marketing as applied to agriculture, legislators and executive officials have given some thought to its extension to other industries. Many believe it is thoroughly practical to apply the principle to coal. It has been resorted to with great success in Germany and has come in for serious consideration in the past in this country.

There is reason to believe that before many months have passed coal operators generally will turn to some form of co-operative marketing as the most promising form of relief from the serious situation now developing as a result of competitive conditions within the industry. The situation rapidly is becoming as bad as that which existed in 1914, when the Raney resolution was introduced in the House of Representatives at the request of Illinois operators, with the idea of allowing them to co-operate in certain ways so as to save many of them from bankruptcy. A condition of distress even worse than that experienced in 1914 apparently is being approached.

Need of a Moses Is Near

The trend toward consolidations already is under way. While this tendency is regarded as having wholesome features—in fact the late F. S. Peabody publicly urged it as the only way to stabilize the industry—most operators do not want to stand by idly and watch their properties go on the bargain counter.

In the 80's the German coal industry was in much the same condition as that into which the American industry is rushing. It should be remembered that conditions surrounding the production of coal in Germany more nearly correspond to the American industry than do British operations. While Germany produces less coal than does the one state of Pennsylvania, it is thought that a lesson can be learned from experience in that country. When Germany was faced with overproduction and the difficulties it brings in its train, coal syndicates were formed. The largest was the Rhenish-Westphalian syndicate in the Ruhr. The wastes incident to overproduction were halted at once and the entire industry placed on a stable and efficient basis.

The feeling is that while the government is thoroughly justified in putting forward suggestions when the general public is suffering, it might be misunderstood were the suggestion to come from it in this instance. Since it is the industry which is suffering, the thought is that the initiative should be taken by those engaged in the coal business.

Public Sentiment Undergoes Change

Many unnecessary losses could have been prevented at various times in the past had the American coal industry been at liberty to resort to co-operative marketing. Never before, however, has the situation been so propitious to obtain the necessary legislation. The public has entertained the feeling for many years that coal prices have been inexcusably high and that the recurring shortages had been increased by collusion and artificial bolstering. Public sentiment in that particular, however, is very different today. It is recognized by everyone that in making its three-year wage contract the industry has given bond to produce steadily. It is entirely obvious that present prices are barely sufficient to permit the industry to live. Under these conditions it is believed that Congress will be ready to listen to co-operative marketing proposals. Legislators are unusually well informed on the principles involved, due to their active consideration of the application of this principle to the agricultural industry.

Just at this time Congress is looking with favor on the Yoakum plan, which proposes the combination on a national scale of all farmer co-operative organizations. This would allow unified selling and unified purchases of all agricultural supplies. No such thought is entertained in applying co-operative marketing to coal. The idea is that there would be forty or more associations. Each of these associations would compete against the others. Under such an arrangement the price of coal to the public would not be enhanced and there would be great public benefit through the stabilization which would be made possible. It is not only that there are too many mines but there are too many companies. The same number of mines could be operated to better advantage if handled in groups.

Some such plan is not without governmental support. The Coal Commission recommended large-scale operation. President Coolidge, in his message to Congress, pointed out that opportunity should be given for large-scale production and he hinted at co-operative marketing. There has been other support in administration quarters and some of the closest students of the coal industry recognize in this a constructive move.

Just at this time the thing most needed is suggestion as to how such associations could be operated and how they could be controlled. How could competition between the districts be insured? Should an association be permitted to allocate business pro rata among its membership? If so, should it be on a basis of mine capacity or on output during some previous period of time? Should such an association be incorporated? If so, should it be under state or federal authority? Should the association arrange to close high-cost mines and produce only from low-cost properties? Should such associations be allowed to handle labor relations as well as marketing problems? Should associations be allowed to buy coal from non-members and resell it? These and a myriad of other questions must be answered before any concrete legislative proposals can be made.

No early legislation on the subject is anticipated, but a year hence, when the demand for relief will be acute, it would be well, it is pointed out, to have the groundwork laid and the legislation in such form that its prompt consideration would be possible.

Big Equipment Order For N. Y. Central?

The New York Central, the Michigan Central, the "Big Four" and the Cincinnati Northern railroads have filed a joint application with the Interstate Commerce Commission to issue $45,630,000 worth of equipment trust certificates.

The money is to be used for the purchase of 189 locomotives, 15,250 freight cars and other rolling stock.

The equipment order is one of the largest ever placed and will bring the rolling stock of the carriers up to a point to meet the needs of heavy fall business.

Miners of Southwest Win; Renew Scale for 3 Years

Coal miners of the Southwest scored a victory May 3, when the Scale Committees of the Southwestern Interstate Coal Operators' Association and the United Mine Workers of Kansas, Oklahoma, Arkansas and Missouri signed a contract renewing for three years the wage scale of 1923. In the joint conference which began in Kansas City, March 28, the operators had demanded a reduction from $7.50 to $6.00 a day in the pay of day and monthly men. The miners, however, demanded renewal for three years of the old contract. The new contract differs from the old only in a few details. Chief of these is a rule requiring final submission for arbitration of disputes to a commission composed of W. L. A. Johnson, commissioner of the operators' association, and John P. White, former international president of the mine workers.

Central Pennsylvania Miners Accept Wage Cuts

Miners employed by the Consolidation Coal Co., at Myersdale, Somerset County, Pa., after a month of idleness, have accepted the terms of the company and resumed work at reduced wages on May 1. The new arrangement sets the price of loading at $1 per ton and assures the miners reasonably regular employment.

One hundred and twenty-five miners have returned to their places in the mines of the Vinton Collieries Co., in Vintondale, Cambria County, Pa. Twenty-five more eviction suits have been started by the company to get possession of houses occupied by miners who refuse to work. This makes a total of 58 ejectments started and 33 families have moved out. The wage cut at Vintondale amounts to 33⅓ per cent for day men and 20 per cent for miners. No. 6 mine is in operation and 152 coke ovens have been fired. The strike which tied up the Vinton collieries became effective on March 17.

New Prices at Milwaukee

(Effective May 1)

BITUMINOUS (Wholesale)

Pittsburgh, Hocking and Youghiogheny	$6.75
Pile run	6.00
Screenings	5.00
West Virginia screened	6.50
Pile run	5.75
Screenings	5.00
Pocahontas screened	8.75
Mine run	6.50
Screenings	5.75
Smithing	8.75
Kanawha gas mine run	7.00
Illinois and Indiana screened	6.50
Pile run	5.75
Screenings	5.00
Byproduct coke, large size and nut	12.90
Pea	9.90
Gas coke, large size	10.50
Small and nut	8.50

ANTHRACITE (Retail)

Egg	$15.90
Stove	16.30
Nut	16.15
Pea	13.80
Buckwheat	11.00

Union Official Resigns; Blames Outlaw Strikes

Because recent conventions of Subdistricts Nos. 3 and 4 of District No. 17 as well as some of the union officials of the district have put their stamp of approval on unauthorized strikes, Andrew W. McComas, president of subdistrict No. 4, has tendered his resignation to C. F. Keeney, president of District No. 17, and it has been accepted. James L. Studdard, vice-president of the district, has been designated to succeed McComas, and James McCleary, a district organizer, has been appointed as vice-president.

The resignation of McComas is an outgrowth of a strike at the Grant Town mine of the New England Fuel & Transportation Co. several months ago. When the men quit work, McComas took the position that the strike was in violation of the contract with the operators. He therefore directed that the strikers return to work. When they failed to do so, the charter of the local union was revoked and that action was upheld by the International headquarters of the union. When the matter was finally settled, however, the charter was restored and the outlawed members were reinstated.

Members of the Grant Town local wanted the scalp of the subdistrict president, however, when the subdistrict convention was held, and for a time it seemed likely that formal charges would be brought against McComas, but it was finally decided that charges could only be brought in a district convention.

The New England Fuel & Transportation Co. did not accept the Baltimore agreement.

Coal Wholesalers to Study Oil Competition

Competition of oil with coal will be one of the subjects for discussion at the annual convention of the American Wholesale Coal Association, at White Sulphur Springs, W. Va., June 3 and 4. Among the phases of the subject that will be discussed are the following: To what extent has oil displaced coal? What further inroads may be expected? Is the competition substantial and permanent or is it merely temporary and passing? Is oil an economical fuel? Is the supply regular and dependable?

It is felt that this discussion will bring out the relative values and costs of the fuels in question, together with the outlook for regular and continuous supply of each for the future. Many other questions of timely interest to those engaged in the distribution of coal will be considered.

Attorney General to Study Issuance of Trade Data

Some clarification of the subject of trade associations and statistics is in prospect as a result of the change in attorneys general. Mr. Daugherty gave this controversy very little personal attention, but he was willing to stand behind certain of his assistants who have assumed what is regarded both in and out of government circles as an unreasonable attitude. It is believed that Mr. Stone, the new Attorney General, will insist on determining this policy for himself. It is known positively that he has not given study to the subject, but he recognizes the importance of having some determination of the matter.

The same staff is on duty at the Department of Justice under the new Attorney General as when Mr. Daugherty was in office. There is reason to believe, however, that Mr. Stone will not leave the determination of such important policies to subordinates. It is understood that he is acquainting himself thoroughly with the situation and is willing to take into careful consideration any suggestions which may be forthcoming from those who believe trade statistics are in the public interest.

Strike at Glen Alden Mines Collapses

Indications point to a resumption of work at all Glen Alden Coal Co. collieries in Luzerne and Lackawanna counties, Pennsylvania, this week. The outlaw strike which broke out April 30, completely tying up the collieries and resulting in the idleness of nearly 20,000 men, collapsed over the week-end, when seven of fifteen collieries affected resumed work.

Disregarding pleas of district officers of the union that they remain at work, the men quit because of the dismissal from the company's employ of an official of a union at Edwardsville, Pa. Two collieries, the Diamond and Storrs, did not heed the strike order and continued operating.

Rinaldo Cappellini, district president, urged the men to remain at work and permit their grievance to come through the proper channels. President Cappellini announced that unless the strike was called off he would dismiss from the miners' union members of the general grievance committee who ordered the strike.

New York Anthracite Circular Prices for May 1

(Gross ton, f.o.b. mines)

	Broken	Egg	Stove	Nut	Pea	Buckwheat 1	Buckwheat 2	Buckwheat 3
Lehigh & Wilkes-Barre	$8.00	$8.35	$8.35	$8.35	$5.75	$3.00	.....	$1.50
Lackawanna	8.00	8.35	8.35	8.35	5.75	3.00	$2.00	1.50
Pattison & Bowns (Erie)	8.45	8.45	8.55	8.35	5.50	3.00	2.00	1.50
Hudson Coal Co	8.60	8.60	8.60	8.60	6.00	3.15	.....	.....
Reading	8.75	8.75	8.90	8.75	6.00	3.00	2.25	.....
Lehigh Valley	8.50	8.60	8.75	8.75	5.75	3.00	2.25	1.50
Lehigh Coal & Nav. Co.	8.75	8.75	9.00	8.85	6.00	3.00	2.25	1.50
Dickson & Eddy	8.65	8.65	8.85	8.70	5.60	On application		
M. A. Hanna & Co.	8.50	8.60	9.00	8.85	5.75	3.00	On application	

Ninety-Three Bodies Recovered from Benwood Mine Five Days After Disaster

Ninety-three bodies had been recovered last Saturday from the Benwood mine, five days after the explosion which entombed 111 miners of the Wheeling Steel Corporation, near Wheeling, and caused the death of all in the mine at the time. Great difficulty has been encountered in penetrating to the entries where most of the miners met their death. Eight bodies were located in the main entry off entry No. 5 east, where wreckage piled in a heap impeded the work of the rescuers. Later, Chief R. M. Lambie, of the Department of Mines, sent rescue crews to the main entry, where it was expected that ten more bodies would be found.

Chief Lambie said last Saturday morning that he had made no effort to learn the cause of the explosion inasmuch as the department and rescue crews had devoted their energies to the work of recovering the dead. Late in the week two more deputy inspectors were sent for from the southern part of the state. They were C. E. Foster, of Logan County, and Thomas Stockdale, of Bramwell. About this time exploration work was taken over by the Barrackville rescue team of the Bethlehem Mines Corporation. Late last Saturday afternoon they were relieved by the crack New River team, which won the championship for mine-rescue and first-aid work two years ago.

Stone falls and gas have hampered the work of rescue crews since the explosion. Many of the victims of the explosion were found in entry No. 8 north. That entry was cleared of most of the bodies by Saturday, but there was one small section where it was expected that the rescuers would find seven or eight additional bodies.

H. Foster Bain, chief of the U. S. Bureau of Mines, and T. T. Reed, of the Bureau's technical staff, reached Benwood late last week to inspect the scene of the disaster and make a thorough investigation to determine the cause of the accident.

About the middle of last week—two days after the explosion—rescue workers were drenched and their work greatly impeded when water broke through the roof and poured down the passageways.

Many parts of the mine are badly wrecked as a result of the explosion.

Program of N. C. A. Meeting Practically Complete

Four speakers of national prominence have definitely accepted invitations to make addresses at the seventh annual meeting of the National Coal Association to be held at the Sinton Hotel, in Cincinnati, Ohio, May 14-16, and plans are under way for the fifth speaker. With this exception the convention program is practically complete. The list of speakers as it now stands and the subjects of their talks are as follows:

Samuel B. Crowell, of Philadelphia, president of the National Retail Coal Merchants' Association, "Our Customers"; John Lee Mahin, president of the Federal Advertising Agency, of Chicago and New York, "Merchandising"; Melville E. Stone, of New York, counselor of the Associated Press, "The Associated Press"; George H. Cushing, editor of *Cushing's Survey*, "Trade Association Activities."

The forenoon of each day of the annual meeting will be given over to consideration of association affairs. This will enable delegates who desire to do so to attend the Exhibition of Mining Machinery and Equipment and discussions of practical mining problems to be held in Music Hall each afternoon throughout the week under the auspices of the American Mining Congress.

Plans are under way for a big public meeting to be held in Music Hall on Wednesday evening. The program for this meeting includes speeches to be made by nationally known figures, which will be broadcast by radio.

The committee of secretaries of the National Coal Association to which was delegated the duty of studying the statistical work of the national and local associations, with a view to expanding such activities and harmonizing them, will submit the following conclusion at the national convention:

"As to the legality of statistical work of associations, doubt about which has been raised by recent decisions of federal courts, your sub-committee finds in these decisions and in the opinions of counsel that the only illegal phase of such activities is in the use made of such statistics. In every instance in which conviction has been secured, the evidence has shown conclusively that improper use has been made of the statistics. We believe, therefore, that all of the statistics herein considered, with the exception, perhaps, at this time, of past sales reports, are entirely legal.

"It is recommended that where the local associations are not now collecting production figures they arrange to do so, beginning at once, either on a daily or a weekly basis, this information to be collected on the forms prescribed by the Geological Survey."

Mine Inspectors Discuss Rock-Dusting Progress

Rock dusting received careful consideration at meetings of Pennsylvania bituminous mine inspectors called by J. J. Walsh, State Secretary of Mines, at the Seventh Avenue Hotel, Pittsburgh, April 29 and 30, to discuss accidents and the means to prevent them.

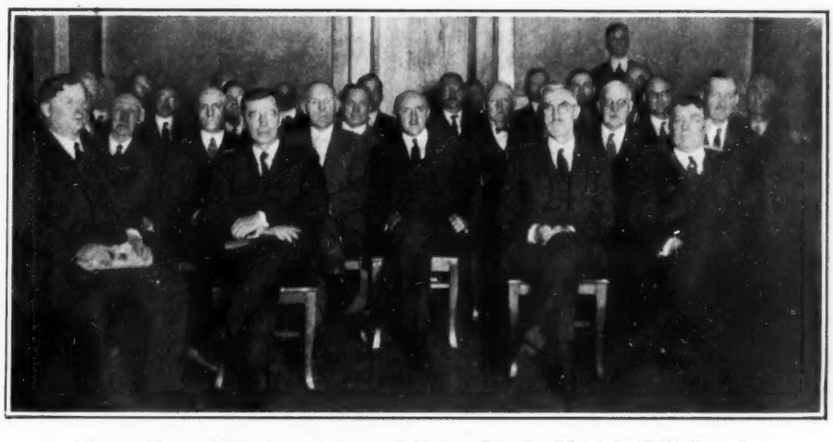
The reports of the inspectors relative to the reception of the rock-dusting movement in their respective districts is indeed encouraging. Many of the coal companies have expressed their desire and intention to adopt this measure of safety just as quickly as ways and means of so doing are provided. They are looking for means of crushing limestone or shale, preferably the former, and for ways to distribute the dust.

The Pennsylvania mine inspectors to a man are in favor of rock dusting. They, like others, see no other way to prevent coal-dust explosions, having lost all faith in methods of wetting down coal dust by sprinkling or humidification.

So firm a grip has the advantage of rock dusting on the minds of bituminous-mine operators and engineers in the State of Pennsylvania that Secretary Walsh believes it will be adopted voluntarily, and prior to the enactment of state laws. Millions of dollars no doubt will be spent during the next year in the installation and use of such equipment.

To Submit Records Promptly

Because accident and fatality statistics as compiled in annual state reports are several years old when they are made available for distribution, a plan was adopted at the meetings by which each inspector will present the companies and the workmen in his district with the various records as they are compiled and will discuss these data with them. Companies will be consulted individually or in groups. Separate conferences will be held with mine officials and workers. By an analysis of the records of each company and a comparison with those of others, the inspectors hope to impress upon the officials and miners the need for and means of accident prevention.



Bituminous Mine Inspectors of Pennsylvania Meet in Pittsburgh

When Secretary Walsh, second from the left in the front row, called a meeting of his inspectors, primarily to discuss rock dusting, he was met with a 100-per cent attendance.

Navy Department Seeks Bids For Year's Coal Supply

The Bureau of Supplies and Accounts of the Navy Department, Washington, D. C., announces the opening of bids May 21 at noon for supplying coal during the fiscal year beginning July 1, 1924, to navy yards and naval stations. Tenders are asked on bituminous or semi-bituminous coal, run of mine, for the following stations, the amounts specified being in gross tons:

Boston Navy Yard, 30,000 tons; Chelsea (Mass.) Naval Hospital, 5,500; South Brooklyn Navy Supply Depot, 8,500; New York Navy Yard and Naval Hospital, 54,500; Iona Island (N. Y.) Ammunition Depot, 2,000; Lake Denmark (N. J.) Ammunition Depot, 1,800; Lakehurst (N. J.) Naval Air Station, 12,500; Philadelphia Navy Yard, 25,000; Annapolis Naval Academy, 35,100; Annapolis Engineering Experiment Station, 1,200; Washington (D. C.) Navy Yard, 50,000; Naval Research Laboratory, Bellevue, D. C., 1,050; Indian Head (Md.) Powder Factory, 28,000; Naval Proving Ground, Dahlgren, Va., 5,000; Hampton Roads (Va.) Naval Operating Base, 21,000; Norfolk (Va.) Navy Yard, 25,000; Portsmouth (Va.) Naval Hospital, 5,500; Navy Mine Depot, Yorktown, Va., 1,500; Charleston (S. C.) Navy Yard, 4,000; Naval Air Station, Pensacola, Fla., 6,000; Great Lakes (Ill.) Naval Training Station, 5,500 tons of run of mine and 34,500 tons 1¼ in. screenings.

Bids on semi-bituminous coal for ships are asked for the following amounts, in gross tons: New York Harbor, 20,000 tons; Philadelphia, 10,000; Hampton Roads, Va., 300,000. For anthracite, bids are sought on amounts from 50 to 2.000 tons for a number of posts in the East.

Courtesy U. S. Distributing Corp.

The Coal Center of New York

The Whitehall Building, 17 Battery Place, houses more coal offices than any other building in the city.

Output of German Coal Mines Attains Pre-War Level

Nearly all the branches of the German coal industry have attained the pre-war level in output. Coke and bituminous coal are slightly under the pre-war figure, but production of lignite, upon which energy has been thrown since the Ruhr occupation, has increased more than 60 per cent.

The total production in March of bituminous coal, coke and lignite throughout Germany, exclusive of the Sarre Basin, was 26,000,000 tons against 22,600,000 for March, 1913.

International First-Aid Meet Postponed

The international first-aid and mine-rescue meet, scheduled to be held at Huntington, W. Va., in September under the auspices of the U. S. Bureau of Mines, in conjunction with the Huntington Chamber of Commerce and various miners' and operators' associations and organizations, has been postponed with the approval of the Secretary of the Interior following a conference between representatives of the Bureau of Mines and the West Virginia committee in charge of arrangements.

Since the announcement of the 1924 meet was first made the Bureau of Mines has received letters from various parts of the country indicating that in view of the depression in the coal industry it would be difficult to insure enough teams attending to make the meet representative of the whole country.

Idle Miners Absorbed by Other Industries

The telegraphic survey of employment conditions throughout the nation conducted by the Labor Department immediately following the close of each month refers only incidentally to unemployment in coal-mining regions. Reference is made to decreased employment in coal mines in Pennsylvania, Ohio, Illinois and Indiana, but the general summaries of those states show no abnormal unemployment, which is interpreted at the Employment Service to indicate that coal miners are being readily absorbed by other industries. Some unemployment of coal-mine labor is reported in Alabama, but in West Virginia some of the labor released in February found work during March.

Number and Annual Output of Bituminous Coal Mines in the United States in 1922 by Classes*

(In Net Tons)

State	Class 1, Producing Over 200,000 Tons: Number of Mines	Per Cent of Total Mines	Per Cent of State Output	Class 2, Producing 100,000-200,000 Tons: Number of Mines	Per Cent of Total Mines	Per Cent of State Output	Class 3, Producing 50,000-100,000 Tons: Number of Mines	Per Cent of Total Mines	Per Cent of State Output*	Class 4, Producing 10,000-50,000 Tons: Number of Mines	Per Cent of Total Mines	Per Cent of State Output	Class 5, Producing Less Than 10,000 Tons: Number of Mines	Per Cent of Total Mines	Per Cent of State Output	Total, All Classes: Number of Mines	State Output
Alabama	18	4.8	37.5	40	10.7	28.9	46	12.3	18.0	96	25.7	13.4	174	46.5	2.2	374	18,325,000
Alaska, California, Idaho and Oregon	...	...	...	...	...	...	...	...	...	3	18.7	81.1	13	81.3	18.9	16	106,000
Arkansas	...	...	...	...	...	...	3	2.3	17.1	28	21.5	55.2	99	76.2	27.7	130	1,110,000
Colorado	14	5.4	39.7	16	6.2	21.5	28	10.8	19.6	59	22.6	15.1	143	55.0	4.1	260	10,020,000
Georgia	...	...	...	...	...	...	1	100.0	100.0	...	...	...	...	...	...	1	61,000
Illinois	103	13.5	62.8	91	11.9	21.7	69	9.0	8.7	124	16.2	5.5	378	49.4	1.3	765	58,467,000
Indiana	23	4.6	34.8	46	9.2	33.5	43	8.6	16.4	89	17.9	12.6	298	59.7	2.7	499	19,133,000
Iowa	2	0.9	10.6	7	3.4	20.2	20	9.7	31.7	56	27.1	31.6	122	58.9	5.9	207	4,335,000
Kansas	...	...	...	2	0.7	8.0	17	6.3	39.1	42	115.5	35.1	210	77.5	17.8	271	2,955,000
Kentucky	25	1.1	19.4	97	4.4	32.3	126	5.7	22.7	354	16.1	21.6	1,597	72.7	4.0	2,199	42,134,000
Maryland	...	...	...	1	0.8	9.2	6	5.1	30.3	24	20.3	42.6	87	73.8	17.9	118	1,223,000
Michigan	...	...	...	2	15.4	37.2	6	46.2	49.3	3	23.0	12.4	2	15.4	1.1	13	929,000
Missouri	...	...	...	1	0.5	6.4	15	6.8	35.1	63	28.4	46.3	143	64.3	12.2	222	2,925,000
Montana	3	4.5	45.6	4	6.1	23.8	6	9.1	17.6	11	16.7	9.8	42	63.6	3.2	66	2,572,000
New Mexico	2	3.5	19.9	17	29.8	62.8	6	10.5	12.3	4	7.0	2.8	28	49.2	2.2	57	3,147,000
North Carolina	...	...	...	...	...	...	1	50.0	72.2	1	50.0	27.8	...	...	...	2	79,000
North Dakota	1	0.7	18.7	...	...	...	5	3.5	24.6	25	17.5	36.3	112	78.3	20.4	143	1,328,000
Ohio	11	0.7	10.7	68	4.5	34.0	85	5.7	23.7	275	18.3	23.3	1,065	70.8	8.3	1,504	26,954,000
Oklahoma	...	...	...	4	2.4	16.0	14	8.3	33.0	57	33.7	43.3	94	55.6	7.7	169	2,802,000
Pennsylvania	105	2.4	28.1	216	4.9	26.5	292	6.6	17.9	1,023	23.0	21.5	2,809	63.1	6.0	4,445	113,148,000
South Dakota	...	...	...	...	...	...	...	...	...	...	...	...	16	100.0	100.0	16	8,000
Tennessee	1	0.4	4.4	11	4.5	29.5	14	5.7	20.8	70	28.7	36.7	148	60.7	8.6	244	4,877,000
Texas	...	...	...	1	2.5	10.9	2	5.1	11.1	30	77.0	75.0	6	15.4	3.0	39	1,106,000
Utah	9	20.9	58.3	10	23.3	33.1	4	9.3	5.6	4	9.3	2.4	16	37.2	0.6	43	4,992,000
Virginia	19	7.9	57.1	13	5.4	17.8	12	5.0	7.3	63	26.3	15.1	133	55.4	2.7	240	10,491,000
Washington	3	6.3	28.1	9	18.8	46.5	4	8.3	10.4	12	25.0	11.9	20	41.6	3.1	48	2,581,000
West Virginia	71	3.6	26.1	170	8.5	29.6	242	12.2	21.2	618	31.2	19.8	880	44.5	3.3	11,981	80,488,000
Wyoming	6	7.7	24.9	22	28.2	49.7	17	21.8	21.6	5	6.4	2.9	28	35.9	0.9	78	5,972,000
Total	416	2.9	31.2	848	6.0	27.8	1,084	77.7	18.3	3,139	22.1	18.3	8,663	61.3	4.4	14,150	422,268,000

* Includ ng wagon mines.

This table represents mines, not companies, for which the showing would be very different. Statistics compiled by L. Mann, U. S. Geological Survey, May 3, 1924

Problems In Underground Management

Advice to Those Using Mechanical Loaders

Judicious Shooting Will Speed Loading—Switches Between Rooms Will Save Time—Take Trolley Into Rooms and Use Short Cable

By Charles H. Thompson
Mining Engineer
Hollis, Va.

SUCCESS in operating loading machines will be determined by the degree to which all co-ordinating factors are made to synchronize and aid in the loading of the coal. It is necessary to consider not only loading but the mining and shooting of the seam, and the transportation of the product to the tipple.

In installing mechanical loaders, use only such systems of mining as already have proved successful in the seam to be worked. Room-and-pillar methods are generally preferable. Avoid the miners' habit of shooting too few shots. Use mechanical drilling, and then there will be no need to avoid the labor of putting in the requisite number of holes. The miner is sparing in the use of holes, not because he thinks large shots save labor in shoveling or produce better coal, but solely because it saves the labor of drilling holes. With more holes the coal will be shot down with less damage to both coal and roof and with greater safety to the men employed. Shoveling will be easy if the coal is properly but not excessively broken.

Better Main-Line Transportation

Transportation is made rapid and free of accident by maintaining good track, properly located wiring, motive power in good condition, well-ordered rolling stock and efficient bonding. The labor to afford these for a given output is greatly reduced when manual loading gives place to mechanical, and consequently with machine loaders all these items can be kept in first-class condition without excessive cost.

Lay out the plan of working so as to determine beforehand every dimension and every angle. Follow this plan with an allowable error of one foot in distance and two degrees in angle. Templates are easily made, and paint is cheap. They will guide the cutters until the surveyor puts up his points. Plan track and wire so that what will fit one place will fit another. Simplify your workings, and you will reduce costs.

Put crossovers in your rooms from one rib track to another and from one center track to the track in the next room, thus the rooms can be made twice as long as they could be made economically without these facilities. If crossovers are put from room to room at each crosscut, much time will be saved in transferring cutters, drills and loaders from one working place to the next.

Use a small No. 2 trolley wire on one room track and work from this with a 75-ft. hand cable. Cut your wire to suit the length of room agreed on and play it out as the room is advanced. Old Ford tires make a handy insulating cover, and extended clapboards with light barn hangers make a satisfactory protection. This saves the time, trouble and expense involved in the use of clumsy duplex cables. Let your gatherer bring enough cars to clean up an entire narrow face or half a wide one. While he goes to get another turn of empties the loading machine can be moved to its next place and be ready to load when he returns. A half minute lost on a 3-ton car means one minute on 6 tons or, where a loading machine will load a ton a minute, 16⅔ per cent of lost time.

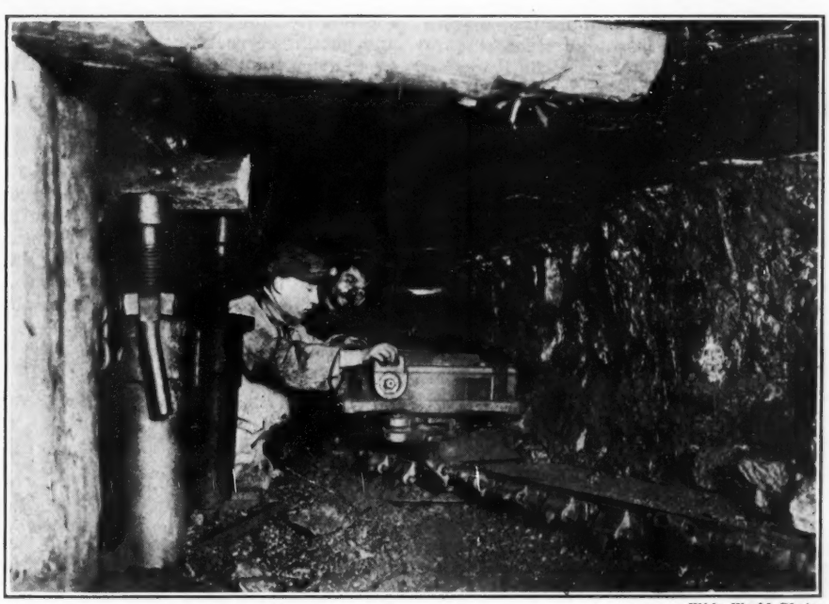
Advance your track heads by use of the inverted-rail and chair method or by the use of inside-point rails and cuffs. Don't allow jumpers to be used. Cut your straight rails to standard length.

Don't mix mechanical loading with manual in the same entry. It can't be done satisfactorily. Put a group foreman in charge of all the cutting, drilling, shooting, track, timber, wire and haulage, which one loading machine requires. The proper number of machines for the entire job soon can be discovered. Pay the men well for a fair task and offer more for a better one. The coal will then move regularly, and a healthy competition will keep the crews at their best.

Prepare Your Coal on Surface

If your seam carries partings, spend part of the saving in preparing the coal on the outside. The final saving in your cost for a marketable product is what you are seeking.

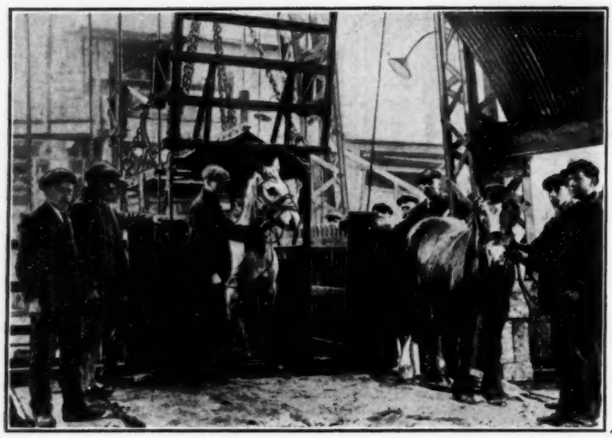
You will find the following advantages in mechanical loading: (1) The coal will cost less and be worth more as it will be an improved product; (2) the men will make better wages by the



Wide World Photos

Undercutter at Work in Wilhelmina Coal Mine, Holland

Note the way in which a large prop is used as a cap piece and is carried over almost to the face of the coal. Also observe the screw jacks with their rapid releasing levers. A snug place to work a coal cutter in, low as to height and narrow as to width of working space. However, the coal appears clean but with irregular cleat.



Hoisting Pit Ponies

Some of the pit ponies in England are what their names signifies, but some, as the illustration shows, are of more stalwart build. Ponies rarely come to the surface except in case of a strike.

elimination of lost time; (3) the risk of serious accident will be reduced as fewer men will be employed; (4) less territory will be opened for a given output with attendant savings in operation; (5) a premium will be laid on intelligence and skill, and hence the living conditions in mining communities will be improved; (6) excavation will be speeded with consequent advantages in handling roof, in recovering ribs, in salvaging of timber and track etc.; (7) the overall investment for a given output will be lowered.

What Rock Dust Costs and How Much Is Needed

By John T. Ryan*

Concurrently with undertaking any program for rock dusting coal mines the relative flammability of the coal should be determined. The Bureau of Mines is always glad to co-operate in this matter and is in a position to render this service.

The raw material for rock dusting should contain little or no free silica and be low in combustible matter. Pure limestone is an admirable material and shale is good. Usually one of the shale formations associated with the coal measures is suitable for rock dusting and it should be given preference, for it is economical to have the source of supply at the mine.

A plant to pulverize the dust to the proper fineness should consist of a simple preliminary crusher to reduce the material to ¾ in. and a pulverizer which will grind the material to powder so that it will all pass through a 50-mesh, and so that at least 70 per cent will pass through a 200-mesh screen. This equipment preferably should be installed at the mine or underground if possible, and an equipment having a capacity of 1,000 lb. per hour is ample.

The next essential equipment is a distributor that will spread the dust properly underground. This equipment should be so designed that it will first air-blast the coal dust from the ribs, roofs, etc., and then dust the same faces with the shale dust. It should have a capacity of 1 lb. per second at a speed of not less than one mile per hour. It should be able, also, to deliver dust to the back of trackless entries at desirable points, relying on the ventilating current to act as the distributor.

Rock-dusting should be done first on all haulageways up to and including room-necks, and up to and including the face of all development workings.

A simple sampling kit should be installed. The purpose of this is to take samples and analyze them for determining the quantity of incombustible material. This should be so simple that the average man about the mine could operate it and run a test in a few minutes. Such a kit has been developed by the Bureau of Mines and is now ready for the market. Samples should be taken twice a month at predetermined points, except in heavy haulage entries where it may be necessary to distribute the dust once a week. A month should never pass without an application of rock dust. Experience will quickly show where and how often samples should be taken.

Clean and Rock-Dust Entries

All entries should be cleaned up as thoroughly and frequently as necessary and should be rock-dusted so there will be no more than 50 per cent combustible matter present at all times. The explosibility tests of some coals may indicate that there should be 70 per cent of incombustible material.

Mine operators are compelled to study the rock-dusting problem from a viewpoint of cost and the scientific facts must be reduced to an economic, commercial basis. We cannot rock dust our mines as they are rock dusted in Europe, because our mining and labor conditions are vastly different. It is claimed in Great Britain that rock-dusting costs 0.1c. per ton of coal mined. Costs in America on a twenty-year basis should be less than 1c. per ton. A reliable commercial pulverizing company quoted an operator in the Pittsburgh district $4 per ton for limestone dust in carload lots, f.o.b. factory. To this would have to be added about $2.50 for transportation and handling.

Tables I and II give respectively an estimate of the initial cost of rock dusting equipment for a 400,000-ton mine on a twenty-year basis, and data regarding the cost of making and distributing rock dust with the basis for the estimate.

Table I—Cost of Crushing and Pulverizing Plant

Pulverizer	$1,500	
Crusher	500	
Two elevators	350	
Two bins	150	
Motor and accessories (20 hp.)	350	
Sampling and analytical kit	75	
Distributor	500	
Auxiliary car	100	
Building	1,800	
	$5,325	
Total cost of installation		$5,325.00
Interest at 6 per cent for 20 years		6,390.00
Amortization, 20 years		5,325.00
		$17,040.00
Cost per ton on an 8,000,000-ton (or 20-year basis)		$0.00213

Table II—Cost of Making and Distributing Rock Dust

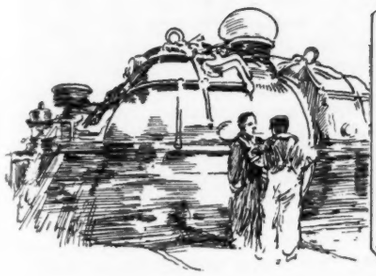
Crushing and pulverizing	$1.00
Distributing	1.55
	$2.55
Approximate length of entries to be dusted in an average 400,000-ton per year mine, miles	50
Average quantity of dust required for each mile, tons	1.8
Quantity required for one dusting, tons	90
Quantity required per year, tons	360
Cost at $2.55 per ton	$918.00
Cost per ton of coal on yearly production of 400,000 tons	$0.0023
Installation and depreciation	0.00213
	$0.00443

Rock dusting has many added advantages; for instance about 90 per cent of the light underground is absorbed by the coal. Rock dust, and particularly that prepared from limestone, greatly improves the illumination, and consequently increases the efficiency of the workman and decreases accidents. Rock dust is an efficient fire-fighting material, and is no doubt much safer to use than either water or chemicals. It is likewise believed that it has special merits as a stemming material for shotholes as compared with clay and many other inert substances.

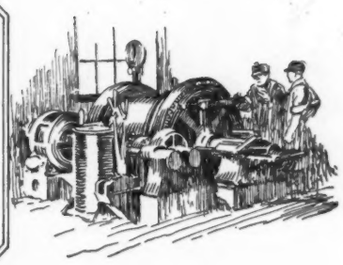
Danger in Driving Rooms Up the Coal Pitch

In the current issue of the Union Pacific Coal Co.'s *Employees' Magazine*, Thomas Fraser, superintendent of the Reliance mine, declares that accidents are more frequent when rooms are driven up the pitch than when directed along the strike. Snubbing and spragging cars are alike dangerous. When they are snubbed the rope sometimes breaks and allows the car to run down the inclination at a high rate of speed. Occasionally the snubbing post is pulled out. Legs and arms are caught in the snubbing rope. More accidents, however, probably are caused by spragging. When the roof is bad or the coal is dirty, the track becomes littered, and the miners are liable to have their hands injured when trying to sprag cars. Another danger is from the coal at the face which overhangs the working face when the room is driven up the pitch. When the miner pulls down the coal from a down-pitch position the coal is likely to fall on him and injure him. In work parallel with the strike of the seam the risk is far less.

*Vice-president and general manager, Mine Safety Appliances Co., Pittsburgh, Pa.



Practical Pointers For Electrical And Mechanical Men



Protective Apparatus for Substation Equipment

The articles which recently have appeared in *Coal Age* on the protection of the motor-generator sets and rotary converters used at mining properties have attracted much attention among the electricians at our mines. The main reason for the interest these men have shown is due probably to troubles which have been experienced by some of the mining companies located near us.

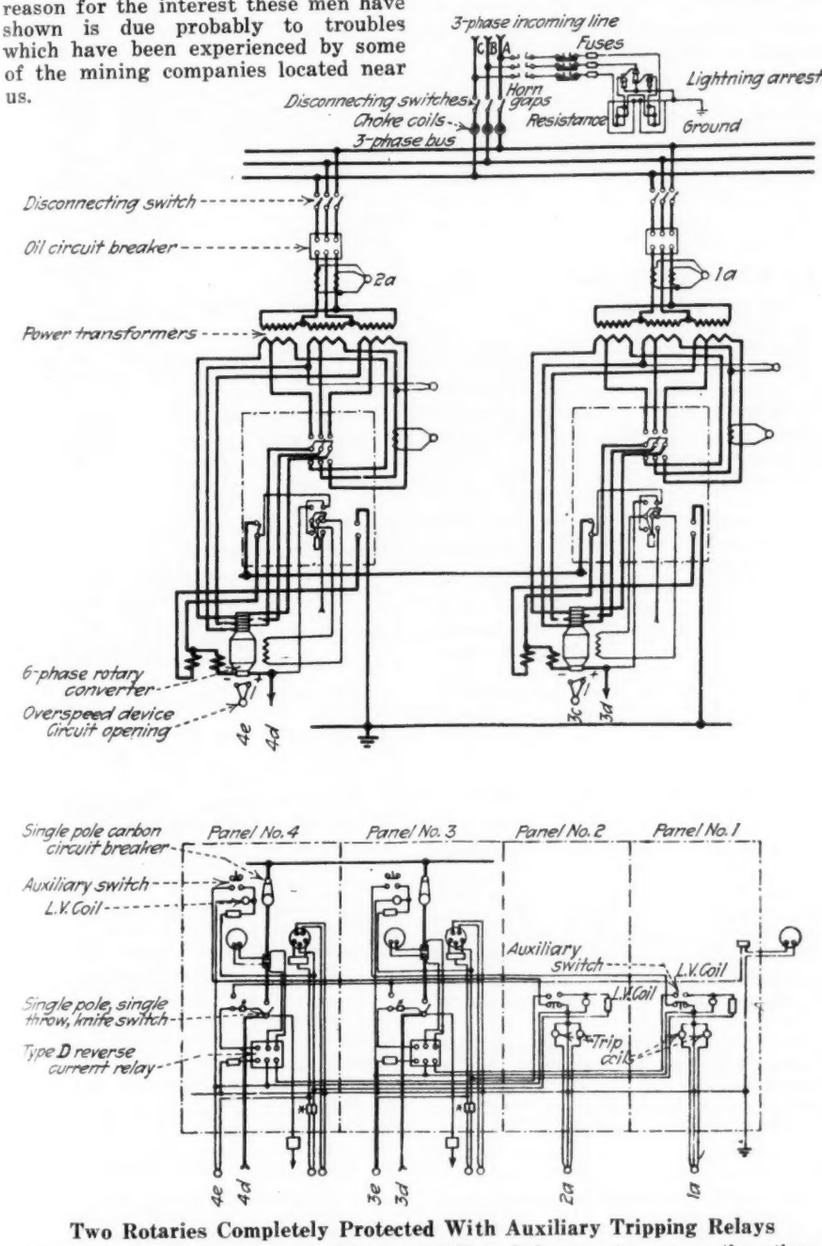
Our company has now almost established standards for the protective equipment used in our power-converting substations. The main incoming alternating-current circuit is protected by three overload induction-type relays. These relays are set so that they will trip only when the load on the alternating-current circuit has reached a value about 200 per cent over the full-load capacity of the converting equipment. The direct-current circuit is protected by a main-generator breaker and several independent feeder breakers. With this arrangement the direct-current end of the power-converting system is doubly protected against overload because an overload on any of the feeders is taken care of by a feeder breaker before the main-generator breaker is affected.

Another important feature is the overspeed device located on the shaft of the motor-generator set or the rotary converter. Whenever any circumstance arises which causes the converting equipment to run at a speed higher than normal this little device operates and disconnects the equipment from both the alternating- and direct-current lines.

A reverse-current relay generally is connected in the direct-current line. Its function is to open the main direct-current circuit breaker should the generator be motored from another source of direct-current energy either in the same station or a remote substation.

It is our general practice to order all our substation equipment furnished with all these protective features, because we feel that the extra cost of having these parts supplied with the original order is much less than the cost of adding them at some later date when we desire to interconnect our machines.

G. D. CAMERON.



Two Rotaries Completely Protected With Auxiliary Tripping Relays

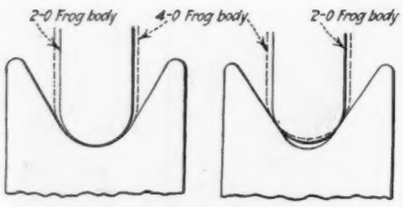
When machines operate in parallel the liability of damage to one or the other is increased. However, when properly protected there is little danger of accident or breakdown. Standardization of switchboard panels and equipment greatly simplifies the work of inspection and protection.

Match Trolley-Wheel Grooves To Overhead Fittings

How the size, kind and shape of trolley wheels affect the proper maintenance of the trolley wire and its attachments is a subject more or less neglected, but nevertheless of great importance. The specifications for trolley wheels are broad enough to allow the selection of wheels varying in width from 1⅜ in. to 1⅝ in., the grooves of which may be of any one of various shapes. The company by which the wheel is supplied frequently gives no consideration whatever to the path over which the wheel must operate.

The trolley wire itself may vary from 1-0 round with a diameter of 0.324 in. when new to 4-0 grooved with a diameter of 0.482 in. as it comes from the factory. After being in service, the diameter is often reduced to 0.25 in. or even less, which undoubtedly causes a deeper groove to be worn in the wheel.

If the wire only were to be considered the problem would be much simpler, but wire must have attachments,



Figs. 1 and 2—U-Shaped Wheel Fits Wire Best

The first figure showing the U-shaped wheel makes a better contact with the wire than the V-shaped wheel which makes contact only on the sides of the groove.

such as frogs, section insulators, splicers and cross-overs, which sometimes more than double the diameter of the path for the wheel.

POOR FIT OF WHEEL IS EXPENSIVE

There is no way to compute how greatly the cost of repairs, replacements and maintenance of an overhead system is increased by the general indifference as to the fit of the trolley wheel and the trolley wire. In my opinion, formed from my own experience and talks with many active operating men, much of this maintenance expense could be eliminated were more consideration given to this important point. I have been given so many greatly varying figures on wheel mileage that it is impossible to strike an average. These figures vary from 100 to 20,000 miles per wheel.

There is a vast difference between the service demands on trolley wheels, but the life of the wheel should depend mainly on the speed and tonnage of the equipment and not on factors which we are better able to control. Most mines use grooved trolley wire which almost entirely removes the trolley ear from direct contact with the wheel.

Much could be said also of poor maintenance of current collector equipment, such as stiff, sluggish bases, bent trolley poles, lack of proper and uniform trolley-base tension. The trolley wire, besides acting as a current supply to the locomotive, must also act as a track or guide for the wheel, and a trolley wire even if in proper alignment will be subjected to unusual wear and burning if the collector is not properly maintained.

ELIMINATE OBSTRUCTIONS ON WIRE

Dewirements of trolley poles, like derailments of locomotives, are caused by obstructions. These are often absolutely necessary overhead appliances, but with properly maintained collectors they would not be obstructions and would not cause dewirements. We have all seen many locomotives pass successfully through complicated overhead work only to note another locomotive dewired when passing the same point, suspending or delaying all traffic. The cause of this could usually be found on that individual locomotive, but it is frequently necessary to call out the electrician to repair the damage and replace broken wire or appliances.

A considerable saving may be obtained by a closer study of trolley wire; its necessary attachments and the collector equipment, consisting of bases, poles, harps and wheels. Trolley wire and the entire overhead current-carrying equipment is burned out rather than worn out by service, and anything which can be done to obtain at all times a better electrical contact between wheel and overhead wire and fittings will tend to increase the life of the equipment and decrease costs.

G. F. ROACH.

The Ohio Brass Co.

Metal Electrode Welding

There are several different methods of welding by electricity, but the one most commonly used is by means of a metal electrode. The operator uses a rod of low carbon steel with which he draws an arc, fusing the metal of the electrode onto the work. The process is comparatively slow but uses a relatively small amount of energy. The metal is deposited more uniformly, the weld is stronger and the finished work is more regular in appearance than when done by the carbon electrode method. As the deposited metal is carried directly to the weld by the arc, this method of welding can be used on vertical surfaces and overhead work. For these reasons the metal electrode weld is more generally used in connection with all-round repair work.

An Economical Way to Cut Slots in a Spray Pipe

Nozzles for spraying water over the long screens used in coal washers do not always satisfy the requirements. If a large number of nozzles are provided it is necessary to use many pipe couplings at the expense of much fitting, whereas if only a few are used they must be operated under such high water pressures that most of the water is lost due to the high velocity with which it strikes the coal or screen.

Pipe, however, can be slotted so as to give satisfactory service, for the slots may be located exactly where needed. Slotted pipe have the further advantage that several orifices are located in a single pipe and thus few couplings or fittings are required, which to connect consume too much of the repairman's time.

OXYACETYLENE PROCESS IS BEST

When our company first resorted to the use of slotted pipe, short holes were cut into the side of the pipe by a milling machine. This method was slow and consequently expensive. When the demand for slotted pipe increased, it was necessary to find some quick and economical method for doing the cutting in the shop, and, when necessary, in the field.

After trying several methods, the oxyacetylene process was tried and it proved to be the most economical, quickest and most adaptable. The position of the slots is chalked on the pipe in accordance with specification, which state the number of slots per foot. By using a two-wheel guide attached to a hand-cutting blow pipe, the cutting is made simple and easy. The slot is narrower at the outside surface of the pipe, the cutting jet being purposely directed so as to make a bevel cut into the pipe wall. In many cases the slot must be so narrow that a dime will just pass through under finger pressure.

Pipes 6, 8 and 10 in. in diameter may be slotted by this method. An operator can slot an average of three standard lengths of 8-in. pipe in one day. The cost of cutting is from 60 to 80 per cent less than by the old method of milling.

Perforated pipe have many uses. They may serve as strainers, sprays and sprinklers, also as injectors and drain pipes. Even where large quantities are not needed it is well to take advantage of the economy and utility of this method of perforating them.

P. T. CONNELLY.

Stopping Flash-Overs on Rotary Converters

A mine rotary of reliable design had been flashing from the alternating-current rings to ground and from phase to phase, with the usual results of melted brass and iron, damaged brushes and ruined pigtails, when an investigation by our department was requested. Every electrical test that could have a bearing on the case was made, with the hope of finding transformer trouble, sudden overloads, etc., but nothing unusual was discovered. No trouble was experienced from other rotaries which took power from the same alternating-current supply and delivered direct-current into the same distributing system. The problem was perplexing.

Transformer cores were taken out of their tanks for careful inspection; low-voltage compression chamber arresters were connected from phase to phase near the alternating-current rings to drain or equalize any high-frequency current that might build up. Field circuits and air gaps were tested, and recording instruments were placed in the field circuit and main circuit to ascertain the behavior of the machine when it flashed over.

SAME MACHINE GAVE GOOD RESULTS

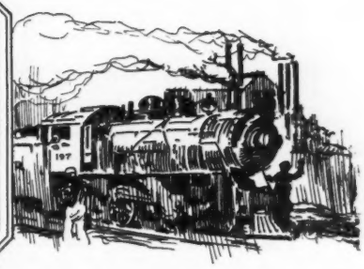
In conversation with some of the operatives at the plant it was learned that all these tests had been made by the local electrician. A machine, the exact duplicate of the one giving so much trouble was being operated in a nearby station and gave excellent results requiring little or no attention.

Visual observation of the machine disclosed the following facts: one of the alternating-current metal and carbon brushes would start a small spark, and in a few minutes long streaming flashes developed until finally the rings flashed over.

Barriers made of asbestos and tape were built up between the slip rings and placed so as to avoid air blasts and dust traps. A slight vibration of the top of the alternating-current yokes was stopped by tying them securely to the bearing pedestal cap. Since that time the brushes have been kept properly lubricated and no further trouble has been experienced.

ENGINEER.

Production And the Market



Sogginess Lingers in Bituminous-Coal Markets; Prices Sag; Production Lower

There has been no discernible upturn from the soggy condition prevailing of late throughout the bituminous coal trade. Reports of shutdowns are less frequent, probably for the reason that they could not go much further, but the operations that are working are on low running time. Most of the business being placed is from railroads, with the usual scattered emergency buying accounting for a large proportion of the remainder. Placement of contracts is still noticeably backward and the movement of tonnage destined for shipment up the lakes is far from impressive. Nevertheless an improvement of undertone is perceptible, the diminished movement of tonnage having served to stablize the markets by eliminating distress coal as a disturbing factor.

Prelude to a Busy Season?

A number of close observers profess to see the present as a transition period—a between-season pause preceding the usual preparations for an autumn revival of business. Speaking of preparations, the New York Central R.R. and allied lines plan enormous additions to rolling stock, the purchase including 189 locomotives and 15,250 freight cars. The new equipment will involve an outlay of $45,630,000, the roads having applied to the Interstate Commerce Commission for permission to issue equipment certificates for that amount. This, taken in conjunction with the recent $28,000,000 order placed by the Chesapeake & Ohio and the reported intention of the Pennsylvania to make a large outlay for the same purpose is convincing proof that the railroads of the country are getting themselves in readiness for a revivification of industry.

The wage dispute that caused a shutdown of the union mines of the Southwest was settled May 3 with a victory for the miners, the joint scale committee of miners and operators having agreed to renew the old scale for three years, the only change in the contract being a provision for submitting matters in dispute to an arbitration commission. The operators sought a 20-per cent reduction in wages.

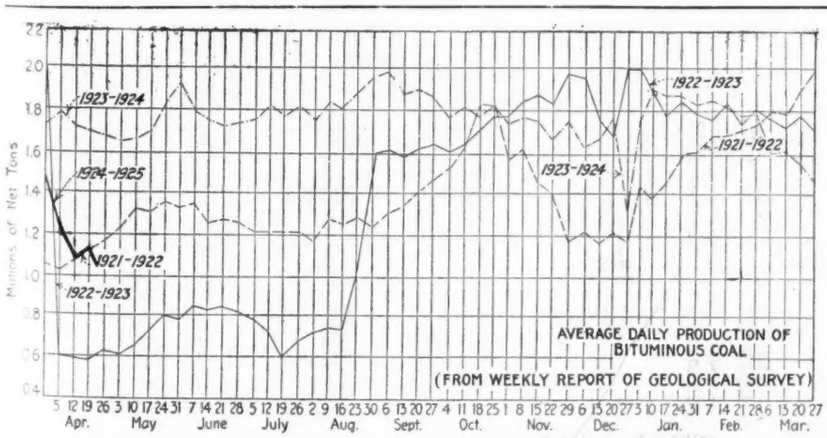
Coal Age Index of spot prices of bituminous coal resumed its recent downward trend during the last week, the May 5 figure being 169 and the corresponding price $2.05. This compares with $2.07 on April 28 and $2.66 at this time last year.

Dumpings at Hampton Roads for all accounts during the week ended May 1 totaled 326,962 net tons, as compared with dumpings of 264,758 net tons in the preceding week.

Dumpings of cargo coal at Lake Erie ports during the week ended May 3, according to the Ore & Coal Exchange, totaled 500,740 net tons; fuel, 20,708 tons. This compares with 341,231 tons of cargo coal and 23,259 tons of fuel coal dumped during the previous week.

Production of bituminous coal took another flop during the week ended April 26, when, according to the report of the Geological Survey, the output totaled 6,726,000 net tons, a decline of 192,000 tons from the previous week. The decrease is attributed largely to the partial observance of Easter Monday as a holiday. Anthracite output also declined, 1,205,000 net tons having been produced, compared with 1,623,000 tons during the week before.

Demand for anthracite continues strong, much of the last-minute April business carrying over into May. Consumers are placing orders in such volume that retailers' yard stocks are not accumulating appreciably. All of the companies and most of the independents advanced prices on domestic sizes 10c. to 20c. per ton May 1.



Estimates of Production

(In Net Tons)

	1923	1924
BITUMINOUS		
April 12	10,401,000	6,834,000
April 19 (a)	10,221,000	6,918,000
April 26 (b)	10,103,000	6,726,000
Daily average	1,684,000	1,121,000
Cal. yr. to date (c)	177,036,000	162,331,000
Daily av. to date	1,776,000	1,631,000
ANTHRACITE		
April 12	2,067,000	1,856,000
April 19	2,065,000	1,623,000
April 26	2,116,000	1,205,000
Cal. year to date	33,718,000	29,633,000
COKE		
April 19 (a)	436,000	256,000
April 26 (b)	424,000	225,000
Cal. yr. to date (c)	6,366,000	4,684,000

(a) Revised from last report. (b) Subject to revision. (c) Minus one day's production to equalize number of days in the two years.

No Life Yet In Midwest

General sogginess of the market continues throughout the Midwest. Some screenings business always is available at fair prices but there is no demand for prepared sizes and all the usual troubles of such a situation are experienced. Midwest fields are shut down as low as ever in history, so that production is down almost out of sight. A survey of operating conditions in Illinois shows well over 100 mines of the 393 shipping units of the state shut down for good with fans and pumps stopped. Almost as many are down with indefinite plans for reopening, thus leaving possibly 150 in active condition. These are getting slim running time except the few having contracts for their entire output.

The only events of interest in domestic business that marked the incoming of May were a definite drop in Pocahontas mine run to $2 by all companies and an increase of about 10c. on all sizes of anthracite by both old-line companies and independents. There is practically no anthracite business. The dealers have been thinking there might be further drops in hard coal at the mines and have declined to stock. The May 1 hoist and the promise of further upward movements each month hereafter are calculated to stir dealers to buy.

Railroad tonnage has fallen off and an air of quietness has crept over the southern Illinois field in the last two weeks that is discouraging to the miners and the only ray of hope lies in the fact that the west Kentucky miners who are on strike may continue out. No change is noted in the situation in Duquoin and Jackson County. Running time is low and there is little business except for railroads. In the Mt. Olive field things are practically at a standstill, excepting on railroad tonnage, with no change in prices. In the Standard field the few mines that are working are selling at production cost or lower.

Business is quiet at St. Louis. Practically nothing is doing in domestic excepting the movement of small cars for emergency purposes. Buying of high-grade Illinois, smokeless, anthracite, coke and Arkansas has not started, but it is expected to get under way this month. Wagonload steam has practically stopped.

Kentucky Business Slow

Operating mines in the western Kentucky field are fairly busy on account of the large number of mines tied up by the miners' strike, but there is little business on prepared sizes, so it is hard to produce enough screenings to meet the demand. Screenings are selling at the mine-run price,

Current Quotations—Spot Prices, Bituminous Coal—Net Tons, F.O.B. Mines

Low-Volatile, Eastern	Market Quoted	May 7, 1923	Apr. 21, 1924	Apr. 28, 1924	May 5, 1924†
Smokeless lump	Columbus	$6.15	$3.35	$3.40	$3.30@$3.50
Smokeless mine run	Columbus	4.00	2.25	2.25	2.20@ 2.35
Smokeless screenings	Columbus	3.75	1.85	1.85	1.75@ 2.00
Smokeless lump	Chicago	6.10	3.10	3.10	3.00@ 3.25
Smokeless mine run	Chicago	3.85	2.10	2.10	*2.00*
Smokeless lump	Cincinnati	6.00	3.35	3.50	*3.25@ 3.50*
Smokeless mine run	Cincinnati	3.85	2.05	2.10	*1.85@ 2.25*
Smokeless screenings	Cincinnati	3.85	1.75	1.85	*1.50@ 2.00*
*Smokeless mine run	Boston	6.35	4.20	4.45	*4.35@ 4.50*
Clearfield mine run	Boston	2.50	2.00	2.05	*1.65@ 2.40*
Cambria mine run	Boston	3.10	2.50	2.50	**2.25@ 2.90**
Somerset mine run	Boston	2.75	2.15	2.25	**2.00@ 2.65**
Pool 1 (Navy Standard)	New York	3.75	2.85	2.85	2.75@ 3.00
Pool 1 (Navy Standard)	Philadelphia	4.05	3.00	3.00	2.75@ 3.25
Pool 1 (Navy Standard)	Baltimore				
Pool 9 (Super. Low Vol.)	New York	2.80	2.20	2.20	2.00@ 2.40
Pool 9 (Super. Low Vol.)	Philadelphia	3.05	2.20	2.20	2.00@ 2.45
Pool 9 (Super. Low Vol.)	Baltimore	2.80	1.80	1.80	**1.75@ 1.90**
Pool 10 (H.Gr.Low Vol.)	New York	2.50	1.85	1.85	**1.70@ 2.15**
Pool 10 (H.Gr.Low Vol.)	Philadelphia	2.45	1.85	1.85	1.70@ 2.00
Pool 10 (H.Gr. Low Vol.)	Baltimore	2.25	1.65	1.65	*1.60@ 1.70*
Pool 11 (Low Vol.)	New York	2.20	1.50	1.50	**1.35@ 1.75**
Pool 11 (Low Vol.)	Philadelphia	2.00	1.50	1.50	1.30@ 1.70
Pool 11 (Low Vol.)	Baltimore	2.00	1.50	1.50	**1.50@ 1.60**
High-Volatile, Eastern					
Pool 54-64 (Gas and St.)	New York	1.80	1.45	1.50	1.40@ 1.65
Pool 54-64 (Gas and St.)	Philadelphia	1.85	1.55	1.55	1.45@ 1.70
Pool 54-64 (Gas and St.)	Baltimore	1.80	1.60	1.60	*1.40@ 1.50*
Pittsburgh sc'd gas	Pittsburgh	2.85	2.40	2.40	2.30@ 2.50
Pittsburgh gas mine run	Pittsburgh		2.10	2.10	2.00@ 2.25
Pittsburgh mine run (St.)	Pittsburgh	2.00	1.85	1.85	1.75@ 2.00
Pittsburgh slack (Gas)	Pittsburgh	1.75	1.30	1.40	*1.30@ 1.40*
Kanawha lump	Columbus	3.50	.....	.....	‡
Kanawha mine run	Columbus	2.25	.....	.....	‡
Kanawha screenings	Columbus	2.05	.....	.....	‡
W. Va. lump	Cincinnati	3.50	2.25	2.35	*1.75@ 2.25*
W. Va. gas mine run	Cincinnati	2.35	1.30	1.40	*1.25@ 1.50*
W. Va. steam mine run	Cincinnati	2.35	1.30	1.40	*1.25@ 1.50*
W. Va. screenings	Cincinnati	2.10	1.00	1.05	*.80@ 1.00*
Hocking lump	Columbus	2.85	2.40	2.45	2.25@ 2.65
Hocking mine run	Columbus	1.95	1.60	1.60	1.50@ 1.75
Hocking screenings	Columbus	1.60	1.30	1.30	1.25@ 1.40
Pitts. No. 8 lump	Cleveland	2.90	2.35	2.35	**2.10@ 2.75**
Pitts. No. 8 mine run	Cleveland	2.15	1.80	1.80	**1.85@ 1.90**
Pitts. No. 8 screenings	Cleveland	1.80	1.40	1.50	**1.50@ 1.60**

Midwest	Market Quoted	May 7, 1923	Apr. 21, 1924	Apr. 28, 1924	May 5, 1924†
Franklin, Ill. lump	Chicago	$3.80	$2.75	$2.75	$2.50@$3.00
Franklin, Ill. mine run	Chicago	3.10	2.35	2.35	2.25@ 2.50
Franklin, Ill. screenings	Chicago	1.85	2.15	2.15	2.10@ 2.25
Central, Ill. lump	Chicago	2.30	2.60	2.60	2.50@ 2.75
Central, Ill. mine run	Chicago	2.10	2.10	2.10	2.00@ 2.25
Central, Ill. screenings	Chicago	1.55	1.90	1.90	1.80@ 2.00
Ind. 4th Vein lump	Chicago	3.35	2.85	2.85	2.75@ 3.00
Ind. 4th Vein mine run	Chicago	2.85	2.35	2.35	2.25@ 2.50
Ind. 4th Vein screenings	Chicago	1.85	1.95	1.95	1.90@ 2.00
Ind. 5th Vein lump	Chicago	2.85	2.35	2.35	2.25@ 2.50
Ind. 5th Vein mine run	Chicago	2.10	2.10	2.10	2.00@ 2.25
Ind. 5th Vein screenings	Chicago	1.55	1.80	1.80	1.75@ 1.85
Mt. Olive lump	St. Louis	.....	2.85	2.85	2.75@ 3.00
Mt. Olive mine run	St. Louis	.....	2.50	2.50	2.50
Mt. Olive screenings	St. Louis	.....	1.50	2.00	2.00
Standard lump	St. Louis	2.50	2.35	2.15	2.00@ 2.35
Standard mine run	St. Louis	1.85	1.95	1.95	1.90@ 2.00
Standard screenings	St. Louis	1.50	1.85	1.80	1.75@ 1.90
West Ky. lump	Louisville	2.60	2.25	2.35	2.25@ 2.50
West Ky. mine run	Louisville	1.90	1.60	1.60	1.50@ 1.75
West Ky. screenings	Louisville	1.75	1.60	1.65	1.60@ 1.75
West Ky. lump	Chicago	2.60	2.25	2.25	2.00@ 2.50
West Ky. mine run	Chicago	1.80	1.60	1.60	1.50@ 1.75
South and Southwest					
Big Seam lump	Birmingham	2.70	2.60	2.60	**2.70@ 2.90**
Big Seam mine run	Birmingham	2.05	2.00	2.00	1.75@ 2.25
Big Seam (washed)	Birmingham	2.35	2.20	2.20	2.00@ 2.40
S. E. Ky. lump	Chicago	3.75	2.25	2.25	2.00@ 2.50
S. E. Ky. mine run	Chicago	2.85	1.60	1.60	1.25@ 2.00
S. E. Ky. lump	Louisville	4.10	2.35	2.10	2.00@ 2.25
S. E. Ky. mine run	Louisville	2.45	1.50	1.50	1.25@ 1.75
S. E. Ky. screenings	Louisville	1.90	1.25	1.10	*.90@ 1.25*
S. E. Ky. lump	Cincinnati	3.35	2.25	2.25	*1.85@ 2.25*
S. E. Ky. mine run	Cincinnati	2.25	1.30	1.35	1.25@ 1.50
S. E. Ky. screenings	Cincinnati	2.00	.90	1.10	*.75@ 1.00*
Kansas lump	Kansas City	3.85	4.50	4.50	4.50
Kansas mine run	Kansas City	3.25	3.25	3.25	3.25
Kansas screenings	Kansas City	2.60	2.50	2.50	2.50

* Gross tons, f.o.b. vessel, Hampton Roads.

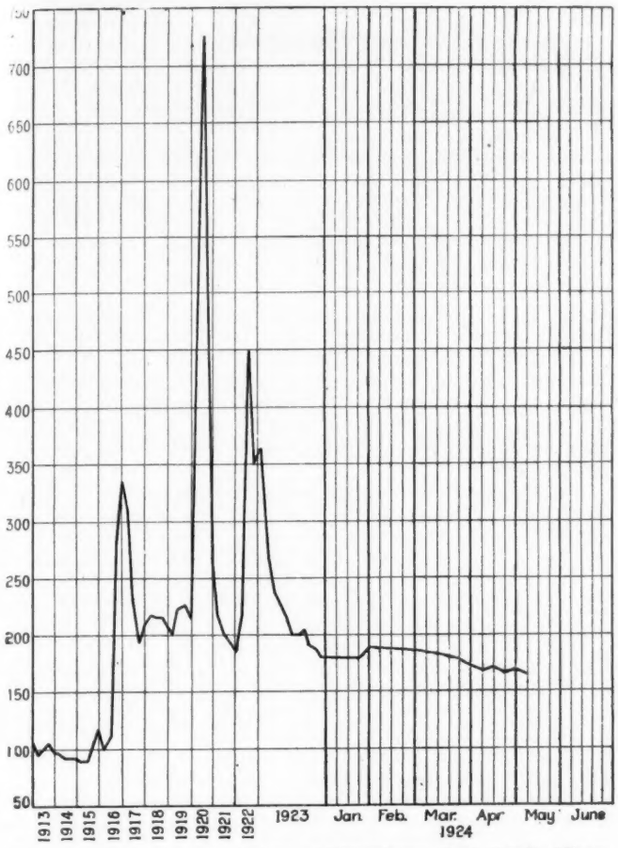
† Advances over previous week shown in **heavy type**, declines in *italics*.

‡ Strike on.

Current Quotations—Spot Prices, Anthracite—Gross Tons, F.O.B. Mines

	Market Quoted	Freight Rates	May 7, 1923 Independent	May 7, 1923 Company	April 28, 1924 Independent	April 28, 1924 Company	May 5, 1924† Independent	May 5, 1924† Company
Broken	New York	$2.34	.....	$7.75@$8.35	.....	$8.00@$8.65	$8.20@$8.50	**$8.00@$8.75**
Broken	Philadelphia	2.39	.....	7.90@ 8.10	.....	8.50@ 8.65	.....	**8.60@ 8.75**
Egg	New York	2.34	$8.50@$11.00	8.00@ 8.35	$8.35@$8.65	8.25@ 8.65	**8.75@ 9.00**	**8.35@ 8.75**
Egg	Philadelphia	2.39	9.25@ 9.50	8.10@ 8.35	8.25@ 9.40	8.60@ 8.65	**8.35@ 9.50**	**8.70@ 8.75**
Egg	Chicago*	5.06	12.00@ 12.50	7.20@ 8.25	7.59@ 7.81	7.65@ 7.72	**7.68@ 7.77**	**7.73@ 7.81**
Stove	New York	2.34	8.50@ 11.00	8.00@ 8.35	8.50@ 9.00	8.25@ 8.85	**8.75@ 9.25**	**8.35@ 9.00**
Stove	Philadelphia	2.39	9.25@ 9.50	8.15@ 8.35	8.60@ 9.50	8.65@ 8.85	**8.70@ 9.60**	**8.75@ 8.95**
Stove	Chicago*	5.06	12.00@ 12.50	7.35@ 8.25	7.90@ 8.03	7.81@ 8.03	**8.03@ 8.17**	**7.94@ 8.14**
Chestnut	New York	2.34	8.50@ 11.00	8.00@ 8.35	8.25@ 8.75	8.25@ 8.75	**8.65@ 9.00**	**8.35@ 8.85**
Chestnut	Philadelphia	2.39	9.25@ 9.50	8.15@ 8.35	8.60@ 9.50	8.65@ 8.75	**8.75@ 8.85**	**8.70@ 9.60**
Chestnut	Chicago*	5.06	12.00@ 12.50	7.35@ 8.35	7.81@ 7.94	7.72@ 7.95	**7.90@ 8.03**	**7.81@ 7.99**
Range	New York	2.34	.....	8.30	.....	8.50	.....	**8.60**
Pea	New York	2.22	6.30@ 7.25	6.00@ 6.30	4.50@ 5.25	5.50@ 6.00	**4.75@ 5.50**	5.50@ 6.00
Pea	Philadelphia	2.14	7.00@ 7.25	6.15@ 6.20	5.25@ 6.50	6.00	**5.75@ 6.25**	*5.75@ 6.00*
Pea	Chicago*	4.79	7.00@ 8.00	5.49@ 6.03	5.13@ 5.36	5.36@ 5.55	**5.36**	**5.36@ 5.91**
Buckwheat No. 1	New York	2.22	2.25@ 3.50	3.50@ 4.15	2.25@ 2.75	3.00@ 3.15	**2.25@ 3.00**	3.00@ 3.15
Buckwheat No. 1	Philadelphia	2.14	3.00@ 3.50	3.50	2.75@ 3.00	3.00	*2.50@ 3.00*	3.00
Rice	New York	2.22	1.60@ 2.50	2.50	1.75@ 2.00	2.00@ 2.25	**1.90@ 2.25**	2.00@ 2.25
Rice	Philadelphia	2.14	2.00@ 2.50	2.50	2.00@ 2.25	2.25	2.00@ 2.25	2.25
Barley	New York	2.22	1.00@ 1.50	1.50	1.50@ 1.75	1.50	*1.40@ 1.75*	1.50
Barley	Philadelphia	2.14	1.15@ 1.50	1.50	1.50	1.50	1.50	1.50
Birdseye	New York	2.22	1.50@ 1.60	1.60	.....	1.60	1.40@ 1.65	1.60

* Net tons, f.o.b. mines. † Advances over previous week shown in **heavy type**, declines in *italics*.



Coal Age Index of Spot Prices of Bituminous Coal F.O.B. Mines

	1924			1923
	May 5	April 28	April 21	May 7
Index	169	171	169	220
Weighted average price	$2.05	$2.07	$2.04	$2.66

This diagram shows the relative, not the actual prices, on fourteen coals, representative of nearly 90 per cent of the bituminous output of the United States weighted first with respect to the proportions each of slack, prepared and run-of-mine normally shipped, and second, with respect to the tonnage of each normally produced. The average thus obtained was compared with the average for the twelve months ended June, 1914, as 100, after the manner adopted in the report on "Prices of Coal and Coke, 1913-1918," published by the Geological Survey and the War Industries Board.

$1.60@$1.75 to the trade, while some mines are unable to accept screenings orders unless the buyer will take lump and egg too. West Kentucky strippers are reported as busy producing something over 120 cars a day. The strike is not having any material effect on the market, as with the present lack of demand for prepared, screenings would be scarce and high.

The Louisville trade reports a continuation of slow business, due to general lack of demand. A little tonnage is moving from the Hazard field to lake ports and there also is some steel-mill business. Utilities and large industries are not buying much coal, and steam-plant demand is slowing up fast, while retailers are buying only very small lots. There has been some railroad contract business placed, but the volume as a whole has been small.

In spite of relatively small production of prepared sizes in eastern Kentucky, screenings are being offered as low as 90c. in the Hazard field, and up to around $1.25 for the best grades of Harlan gas screenings. High prices and small production of screenings in western Kentucky are resulting in a better consumption of eastern Kentucky screenings in the Louisville market, as they can compete on price in spite of a 43c. to 53c. freight-rate differential in favor of western Kentucky.

Northwest Prices Flutter

Soft-coal prices rose in Duluth May 1 and fell in Milwaukee, indicating the Duluth-Superior docks are going to quit giving coal away. Arrival of cargoes and a raise in price of bituminous are the only features of a very dull market at the Head-of-the-Lakes. Since the opening of navigation 31 boats have arrived, 10 bringing anthracite.

New soft-coal prices at Duluth are: Kentucky lump, $7; run of pile, $6; screenings, $4.25; Youghiogheny lump, $6; run of pile, $4.50; screenings, $4.25; Hocking lump, $5.75; run of pile, $4.50; screenings, $4; splint lump, $6; run of pile $5.25; screenings, $4.25; Pocahontas lump, $7; run of pile, $5; screenings, $4.75.

Duluth docks are ready to ship anthracite to the Twin Cities as soon as the rate on all-rail coal becomes effective, May 27. The soft-coal situation is still waiting, as it has been for two years, on the I.C.C. decision in the Illinois mine-rate case.

The Milwaukee market continues dull, but dealers are looking forward to a moderate revival of trade as a result of a reduction in soft-coal prices which became effective May 1. The cut in prices ranges from $1 to $1.50 per ton. Screened Pocahontas, however, was reduced $2.25 per ton. Coal cargoes continue to arrive. The movement will be much slower than last season, however, because of the large amount of carry-over. April arrivals embrace four cargoes of anthracite and eight cargoes of soft coal, the former aggregating 40,576 tons and the latter 61,499 tons.

Western Business Spotted

Scale committees of operators and miners of the Southwestern district, in joint session in Kansas City since March 28, finally agreed May 3 to a renewal for three years of the old contract. Mines through Oklahoma, Kansas, Missouri and Arkansas operated by members of the Southwestern Interstate Coal Operators' Association still are closed, but a few mines outside the operators' association, for which contracts have been signed, are putting some coal on the market. This augments the steady flow to the Kansas City market of coal from other districts, so there has been no hint of shortages.

The coal market in Colorado experienced another dull week. Very little movement of anything but domestic sizes was noted. Mines worked on an average of a little less than half time and the operators report 36 per cent of the lost time due to no market.

In Utah the retailers are buying a little more coal as a result of weather conditions. Mining, smelting and cement plants are providing the best coal market among the industrial concerns. Railroads are buying from hand to mouth. Working time at the mines is around two and a half days a week. Operators are now able to care for all slack orders, due to a slower market rather than an increase in production. The railroad tracks at the mines are still crowded with "no bill" cars.

Ohio Markets Dull; Prices on Firm Basis

Dullness still characterizes the Ohio trade. Steam buying at Columbus is low, as consumers are still using reserves. Although some of the heavier consumers have reduced their accumulations to normal and are coming into the market, many others are content to rely on stocks. The net result is a reduced demand, which is reflected in lesser output in all fields of the state. Little contracting outside of railroad fuel is reported, although there are inquiries. Consumers are content to buy on the open market, believing that contract prices may be reduced later. There is still quite a spread between contract and spot quotations. Little movement in domestic sizes is reported. Lake trade is showing some signs of revival, as there has been some inquiry for tonnage for Lake shipment. But so far little has been done outside of the companies having their own dock connections.

There is sentiment in the Cincinnati market that values have reached a firmer plane than for some time past. The marked strength of the domestic smokeless sizes is one of the features of the market. River business is proceeding in good volume by the shippers who have an outlet through Huntington. A cargo or two has come through from the Kanawha and the word is that some of the operators there that formerly were in agreement with District 17 of the United Mine Workers are getting ready to run on a large scale on the open-shop basis. Only one change has been made in the local retail prices and this was the dropping of the bituminous lump to $6 a ton. Quotations on specialized coals are as follows: Lump, $3@$3.50; egg, $2.50@$3.

Cleveland consumers seem bent on consuming stockpiles before entering the market for additional fuel in any significant quantities. Most of the inquiries are confined to slack

and nut and slack, and these grades continue scarce, as lump is not being produced either for the Lake trade or domestic purposes. Generally speaking, there is little contracting, and steam buyers depend largely on the open market. Of course, the railroads are expected to be contracting right along, where they and the operators can get together on prices. The first season charters in the coal trade are reported to have been made during the past few days. The railroads have about 8,000 cars at the lower Lake ports.

Production in the Pittsburgh district is at 15 to 20 per cent of capacity. Consumer-owned mines are running better than the merchant mines. Line consumption is decreasing and the spot market continues extremely quiet.

Trade at Buffalo is still quiet, though there is more hopefulness in the tone of the reports made by shippers. Some look for a recovery by July, basing their ideas mainly on the reduction of output.

New England Trade Healthier

The steam trade in New England continues to develop a rather healthier condition, but there has not yet been any comprehensive buying outside of railroad circles. New England shares the general dullness in industry, and in no part of the territory is there much interest in spot prices. The low levels of a fortnight ago have practically disappeared, and quotations seem to show a steadier tone. The trade realizes there is a long distance to go before prices can be influenced by demand, but there is a disposition to counsel operators against mining coal in advance of definite prospects, and if this can be followed for another month or so there will be a better outlook for June and July.

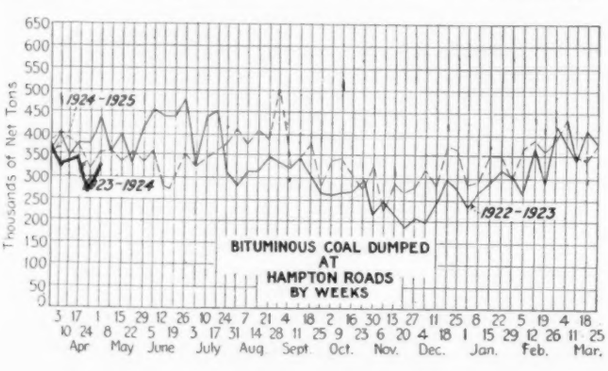
At Hampton Roads the accumulations of Pocahontas and New River average much less than during the early part of April. Prices are measurably improved in consequence, and it may be we have heard the last of "distress" coal for the season. Spot figures are $4.35@$4.50, depending upon grade, and there is a fair chance of the price level being raised another 15c. or so during the week. There is a certain amount of over-sea business offering, although the tonnage is only of moderate size, and this with staple contracts coastwise gives the agencies some encouragement.

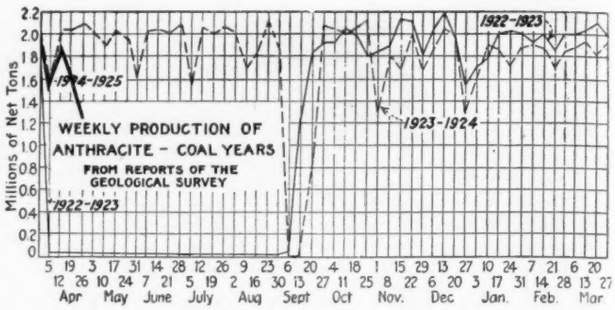
Meanwhile, low prices on Navy standard coals have been named for retail delivery through the season, especially in Boston. The School Department of the city was offered New River at $6.29 per net ton delivered by truck, long hauls as well as short, and this does not argue for sharp advances at wholesale during the summer. It should be said, however, that anthracite trade also is dull, and the retail dealers find themselves in position where their equipment needs to be kept in service on something.

Smokeless coals are being quoted on cars at Boston, Providence and Portland on about the same basis as a week ago. There is only scattering request, and practically all the factors are carrying heavy stocks.

Seaboard Markets Inactive

There is little activity in the New York market. Movement of coal at tidewater has been sufficient to clean up "distress" coal, but occasionally buyers are able to pick up a cargo of good coal at a low figure. Cars at the local terminals during the first five days of last week ranged from 1,060 cars on May 2 to 1,260 cars on April 29, while dumpings ranged from 174 cars on May 1 to 436 cars on April 30. Some hope is being placed in Lake shipments, many coal men expecting that with the Northwest taking its normal tonnage the Eastern situation will be strengthened. Local demand has been affected by the dullness in industrial lines in northern New York and New England.





Demand at Philadelphia continues to slip and the end of the slump is not in sight. One of the greatest disappointments is the contract trade. Consumers continue a waiting game, buying blocks of coal in the open market from time to time, with the intention of coming into the spot market again.

Buying at Baltimore is about on the basis that has existed for several weeks past and the offerings to consumers remain about the same also. Scarcity of contracts continues, but the trade feels that as soon as an upward tendency appears in the spot market there will be a move by industries both large and small to get under contract cover for deliveries for the coming autumn and winter.

Dullness is still marked throughout the West Virginia fields, many mines being idle. A few companies manage to obtain short-time contracts, but as a rule there is little spot business to be had. The circular price on smokeless mine run for May has been reduced to $2 as compared with the April circular price of $2.25 a ton. High-volatile mines also suffer from marked sluggishness in demand.

Trade in Birmingham has improved none during the past week. Buying is confined largely to lots of a few cars in the spot market and amounts in the total to a comparatively light tonnage.

Strong Demand for Anthracite

Demand for all sizes of anthracite continues strong at New York, although pea coal moved a trifle easier at the end of the week. With output curtailed by numerous local labor troubles throughout the hard-coal fields, operators have no difficulty in moving their product. The last week of April was active for shippers, who were rushed for deliveries on account of the increase in prices which went into effect May 1. All of the large operators as well as most independents added from 10c. to 20c. on all domestic coals, including pea coal in one instance, while one of the companies made its prices for broken 45c. higher than during April. Retail prices were not advanced on May 1. Stove coal continues the shortest of the larger sizes. Egg and chestnut are strong. Steam coals are holding steady and with the output down there is little chance of accumulation.

Cool weather in Philadelphia is keeping up a fair trade for current consumption. Though there has been a general increase in mine prices, dealers have not increased their prices, but it is likely that they will do so when the next monthly advance comes along. Dealers are using these advances in mine prices to encourage consumers to order at once, but the response is only moderate. Increased orders for domestic coal to be stored in cellars for the coming fall and winter has proved an encouragement to Baltimore dealers. There is no rush, but enough business is now developing to keep most of the dealers fairly busy.

Stagnation still prevails in the coke market at Connellsville. Output of beehive coke during the week ended April 26 was 225,000 net tons, according to the Geological Survey, compared with 256,000 net tons during the previous week.

Car Loadings, Surplusages and Shortages

	Cars Loaded — All Cars	Cars Loaded — Coal Cars
Week ended April 19	876,923	124,750
Previous week	881,299	127,792
Same week in 1923	958,042	179,781

	Surplus Cars — All Cars	Surplus Cars — Coal Cars	Car Shortage	
April 22, 1924	321,832	189,600	.....	.....
Previous week	305,981	180,620	.....	.....
Same date in 1923	11,062	2,582	44,299	20,725

Foreign Market And Export News

Reaction Grips British Coal Markets; Prices and Output Slump

The South Wales coal market is very irregular and somewhat difficult conditions prevail. Under a strike menace the market was buoyed up and prices soared; now that a strike is unlikely a reaction has set in and buyers are holding off. In any case the miners have agreed to remain at work until the findings of the Court of Inquiry become known, and even then a majority by ballot of two-thirds is necessary before a strike can take place. Owing to the superabundance of stocks three collieries have been closed down. The tendency of prices is steadily downward and the outlook is unpromising. Much business is being lost to the United States and Germany.

The Newcastle market is easier, though any available coal is readily disposed of. Most of the collieries are busy overtaking arrears of delivery and many buyers are waiting further developments before placing contracts for heavy delivery during May and June. Several orders from European gas works are being handled in the north of England, the heaviest being in the neighborhood of 6,000 tons.

Coal output by British mines during the week ended April 19, a cable to *Coal Age* states, was 4,994,000 tons, according to official reports. This compares with 5,843,000 tons in the week ended April 12.

French Industrial Demand Holds; Domestic Inquiry Declines

The situation in the French coal market shows little change, demand for industrial fuel holding well, but inquiry for household coal showing a decline since the beginning of the month.

In the regions of France ordinarily dependent upon British fuels there has been an increased demand since the decline of sterling, and with the decline at the shipping docks, since the passing of the strike menace, prices of British fuels in France are more accessible than a month ago. In certain parts of France they work out cheaper, for coke and coking smalls for instance, than some of the German indemnity fuels of corresponding grades.

As the difference in price of British and French coals gets lower, there is less stimulation to purchase home output; even so French collieries are unable to meet all requirements.

Supplies of coke to the O.R.C.A. continue to exceed the level prevailing before the occupation.

The O.R.C.A. statutes will be those of the S.C.O.F. Apportionment of German fuels (coke and coking smalls) to metallurgists will be in proportion to their consumption capacity based on the number of furnaces in blast and not on their capacity of production, as previously arranged. The prices and quantities of coke and smalls bought by the consumers apart from the indemnity fuels also will be considered in apportioning deliveries.

Receipts of indemnity fuels in March totaled 1,001,900 tons, comprising 363,200 tons of coal, 589,900 tons of coke and 57,800 tons of lignite briquets, compared with 808,700 tons in February and 775,900 tons in January last.

Trade Slack at Hampton Roads; Market Tone Weak

Business at Hampton Roads is slack, with demand light, except in bunker trade, where business is fair to good. Coastwise and foreign movement is light, with little increase in this trade in immediate prospect.

Supplies at the piers continue to dwindle, being far below the average, although the supply is equal to demand. Shippers report operations running on reduced schedules or shut down pending a pick-up in the trade.

Prices remain about the same, and the tone of the market is weak. The general impression in the trade is that prices are too low to make good business possible at this time.

Export Clearances Week Ended May 3, 1924

FROM BALTIMORE

	Tons
For France:	
Bel. Str. Menapier	7,232
For Porto Rico:	
Am. Schr. Delfina	486

FROM HAMPTON ROADS

For Argentina:	
Br. Schr. North Pacific for Buenos Aires	5,924
For Brazil:	
Nor. Schr. Romsdalshorn for Rio de Janeiro	8,480
Br. Schr. Blythmoor for Rio de Janeiro	8,906
Br. Schr. New Townto for Rio de Janeiro	7,406
For Canada:	
Nor. Schr. John Bakke for Kingston	2,018
Ital. Schr. Vesuvio for St. John	6,712
For Cuba:	
Nor. Schr. Sagoland for Havana	2,533
For Hawaii:	
Amer. Schr. Orleans for Pearl Harbor	9,137
For Italy:	
Dan. Schr. Gudron Maersk for Porto Ferrajo	6,616
Grk. Schr. Eugenie S. Embiricos for Genoa	8,149
For West Indies:	
Br. Schr. Berwindmoor for Port de France	7,526

FROM PHILADELPHIA

For Canada:	
Br. Schr. Nettie for St. John	...
Br. Schr. Minas for St. John	...
For Cuba:	
Swed. Schr. Thyra for Havana	...
Nor. Schr. Andersen for Antilla	...
For Porto Rico:	
Am. Schr. Millinocket for San Juan	...

Hampton Roads Pier Situation

N. & W. Piers, Lamberts Pt.:	April 24	May 1
Cars on hand	1,617	985
Tons on hand	98,836	61,183
Tons dumped for week	106,026	145,413
Tonnage waiting	12,000	16,000
Virginian Piers, Sewalls Pt.:		
Cars on hand	1,114	1,151
Tons on hand	73,600	78,850
Tons dumped for week	64,516	77,116
Tonnage waiting	2,576	10,773
C. & O. Piers, Newport News:		
Cars on hand	1,228	1,070
Tons on hand	64,012	53,070
Tons dumped for week	65,849	68,598
Tonnage waiting	.....	625

Pier and Bunker Prices, Gross Tons

PIERS

	April 26	May 3†
Pool 9, New York	$4.74@$5.00	*$4.70@$5.00*
Pool 10, New York	4.40@ 4.75	4.40@ 4.75
Pool 11, New York	4.25@ 4.50	4.25@ 4.50
Pool 9, Philadelphia	4.70@ 5.05	4.70@ 5.05
Pool 10, Philadelphia	4.45@ 4.80	4.45@ 4.80
Pool 11, Philadelphia	4.30@ 4.55	4.30@ 4.55
Pool 1, Hamp. Roads	4.35@ 4.60	*4.35@ 4.50*
Pool 2, Hamp. Roads	5.15@ 4.30	*4.15@ 4.25*
Pools 5-6-7 Hamp. Rds.	4.00@ 4.15	*4.00@ 4.15*

BUNKERS

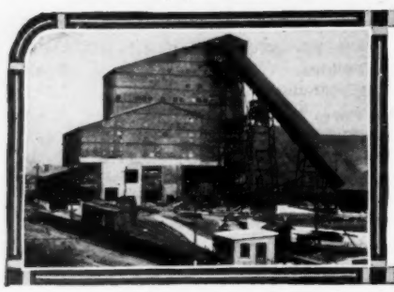
Pool 9, New York	5.05@ 5.30	*5.00@ 5.30*
Pool 10, New York	4.70@ 5.05	4.70@ 5.05
Pool 11, New York	4.55@ 4.80	4.55@ 4.80
Pool 9, Philadelphia	5.00@ 5.40	5.00@ 5.40
Pool 10, Philadelphia	4.75@ 5.00	4.75@ 5.00
Pool 11, Philadelphia	4.50@ 4.80	4.50@ 4.80
Pool 1, Hamp. Roads	4.35@ 4.60	*4.35@ 4.50*
Pool 2, Hamp. Roads	4.15@ 4.30	*4.15@ 4.25*
Pools 5-6-7 Hamp. Rds.	4.15	*4.00@ 4.15*

Current Quotations British Coal f.o.b. Port, Gross Tons

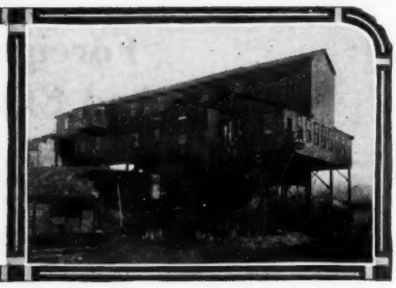
Quotations by Cable to *Coal Age*

Cardiff:	April 26	May 3†
Admiralty, large	29s.@30s.	*27s.6d.@28s.*
Steam smalls	21s.	*18s.@19s.*
Newcastle:		
Best steams	25s.6d.@27s.6d.	**27s.**
Best gas	25s.@25s.6d.	*24s.6d.*
Best bunkers	24s.6d.@25s.	*23s.6d.@24s.*

†Advances over previous week shown in **heavy type** declines in *italics*.



News Items From Field and Trade



ALABAMA

Herman V. G. Lwowski, president of the Ruhr section of the Association of German engineers and manager of the Hugo Stinnes Coal Mines at Essen, Ruhr, accompanied by two associates, visited the Birmingham district recently, inspecting the plants of the Alabama Power Co., having come to this country to make a study of hydro-electrical problems.

The Bankhead Coal Co., Bankhead, has opened a new seam at its mine in Jasper, with a daily capacity of 2,000 tons, giving it an output of about 3,000 tons. The company contemplates erecting a five-car tipple at the new opening.

Chicago capitalists owning about 3,000 acres of coal lands near Morris, in the upper part of Jefferson County, inspected the properties recently, and it is understood will commence development of the lands in the near future. The visitors were shown over the properties by Chas. F. Wheelock, a mining engineer, of Birmingham.

The Hercules Powder Co. has begun the construction of its new plant on a tract of 1,280 acres of land recently purchased near Bessemer, which it is estimated will cost about $300,000 and will have a capacity of 750,000 lb. of explosives monthly, with provisions to double this output if needed. J. J. Grimes is manager of the local branch of the company. The present plant near North Birmingham will be abandoned when the new works are completed.

ARKANSAS

The Paris Coal Basin Mining Co. has been incorporated in Fort Smith with a capital stock of $25,000. Henry Stroupe is president, and E. H. McCullock is secretary.

IDAHO

The Oregon Short Line is putting it up to the Teton Coal Mine Co. in a case now before the State Public Utilities Commission. The mining company, which is reopening the old Teton basin mines, wants the commission to order the railroad to repair and operate the nine-mile Short Line branch from Tetonia Junction to the mines, so that the mining company can ship the possible 500 tons of coal daily which it may produce. The railroad company answers that the repair bill would be $32,000 and asks the coal company to finance the work, the railroad to return 2 per cent of the gross transportation revenue of the line for five years. The road contends that the branch was built in 1918 for $290,433 by order of the U. S. Railroad Administration and that the mines never shipped much coal because of its quality and the fact that the market was and is well supplied from Utah and Wyoming. Therefore it holds that if any further expenditure is to be made on the branch line, the coal company, and not the railroad, ought to assume all liability of loss. The coal company declines, and claims the cost of conditioning the line will be only $1,000 instead of $32,000. The commission has not made its decision.

ILLINOIS

The entire sales organization of both the St. Louis and the Chicago offices of the Lake & Export Sales Corporation recently made a trip from Chicago to the Lesco-Scranton mine at Marion, and then to St. Louis. An inspection was made of this mining property, as well as a visit to the Pyramid strip operation, also near Marion, the output of which is handled by the Lesco organization. The party was under the direction of D. S. Gent, president, and W. L. Walton, vice-president of the Lake & Export Sales Corporation.

The Chicago Coke & Coal Corporation, 3,600 Princeton Ave., Chicago, has been incorporated, with a capital of $100,000, to mine, ship, prepare for market and deal in coal, coke, building materials and products. The incorporators are F. R. Gregg, F. Trilling, George D. Kimball, L. L. Gowan and V. L. Abbey.

Fire about midnight on the 27th destroyed $65,000 worth of buildings of the Williamson County Mine, near Johnston City, owned by the St. Louis Coal & Iron Co., of St. Louis. All the surface buildings were destroyed except the tipple, which was slightly damaged. It is undecided at this time whether this mine will be reopened at this point. The company is at the present time sinking a shaft east of Johnston City to tap No. 5 vein, and if found satisfactory further development of the property may be worked in this vein. The acreage of the No. 5 vein in these holdings has been practically worked out. This is the oldest operating mine in Williamson County.

Henry Wonder and Thomas Wonder have purchased the mine of the Clift Coal Co., west of Henry, and will operate the business.

The Frisco Railroad contract at St. Louis went to the Indiana & Illinois Coal Corporation for mine run from the central Illinois field at $1.77, it is reported. The lowest bid on Standard coal was $1.80, and this coal is graded above Standard. It is understood that the operator really makes more on his coal than $1.77 on account of a division of rates between the C. & E. I. and the Frisco lines. These mines are located on the C. & E. I. and owned by that railroad. Other contracts recently were the Rock Island, reported for mine run at $1.78. This tonnage all moves through the St. Louis gateway and the Frisco amounts to 900 tons per day.

The Standard Oil Co. is preparing to resume mining at its Schoper mine at Carlinville. The company has been operating two mines in the vicinity of Carlinville, but will not reopen the Berry mine.

George W. Reed, vice-president in charge of sales for the Peabody Coal Co. of Chicago, is vacationing at Hot Springs, Ark.

The office of the Big Creek Coal Co., at Harrisburg, was destroyed by a fire which swept a business block in that city with total loss of $150,000.

KANSAS

Thirty days in which to be reinstated in the United Mine Workers was granted miners of the Kansas field who worked during the strike of 1922 and since had not established their union membership, Harry W. Burr, secretary of District No. 14, announced April 28. The dispensation was recommended by a committee from the international board which recently investigated conditions in the district.

Alex Howat has caused another disturbance in Kansas. This deposed district president of the United Mine Workers asserts that the Sheridan Coal Co., which operates in the southwestern district but which does not belong to the operators' association there, offered him $6,000 a year to become superintendent of its mines. Alex says he refused and declares nobly: "I refused because I am resolved to stay on the miners' side as long as I have anything to do with the mining business in any way. The miners have stood by me through all my fights in the past 22 years and I will stand by them." But both W. F. Megeath, president, and J. E. Megeath, vice-president, of the Sheridan Coal Co. and both of Omaha, Neb., deny they ever offered the job to Howat. They visited Pittsburg recently and were in conference with him.

KENTUCKY

National guardsmen protecting the property of the Liberty Coal & Coke Co., at Straight Creek, were fired upon from the surrounding hills on the night of April 27. After several shots were fired the guardsmen returned the fire with machine guns. So far as known no one was struck. There are about twenty troopers in charge of the plant.

The John P. Gorman Coal Co., Lexington, has purchased the Elk Creek Coal Co. holdings at Blackey, Letcher County, for a reported price of $400,000. The former owners had their principal office at Knoxville. The mines have a rated capacity of 750 tons daily. The Elk Creek company has Arthur Groves as president; F. F. Floyd, vice-president; both of Knoxville. The Gorman company has a large mine at Fourseam, in the Hazard field.

The Pike Fuel Co., which was recently incorporated in Pikeville, with a capital of $10,000, has been organized with Willis Staton, president; G. W. Hoskins, secretary and treasurer, and has 150 acres of coal land under development. Present output is 50 tons per day.

Better power is in prospect in southeastern Kentucky as a result of opening the first unit of the new 44,000-hp. steam plant of the Kentucky Utilities Co., at Pineville. The company furnishes most of the power used in both the eastern and western state fields. A high-tension line will connect the Varilla and Pocket plants with the Pineville plant, and also with a new hydroelectric plant, at Dix River, which will be completed within a year.

The Chickasaw Coal Co., recently incorporated in Madisonville, with a capital of $25,000, has been organized with B. C. Mitchell as president, and is developing 100 acres. The output is to be 150 tons per day.

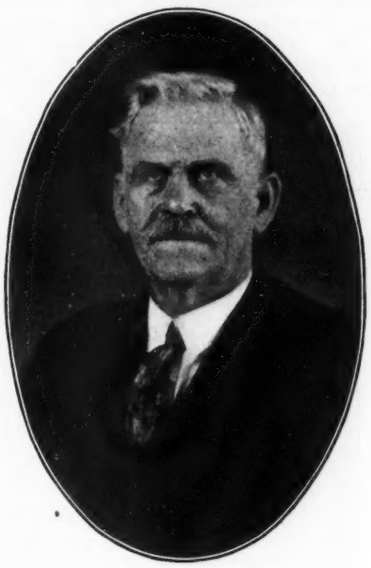
Coal men of Southeastern Kentucky are much interested in the appointment of Major E. S. Helburn as a member of the Highway Commission of Kentucky by Governor Fields. Major Helburn is the president of the Log Mountain Coal Co., with headquarters at Middlesboro and it is felt that with his intimate knowledge of the needs of the coal-producing districts the long-delayed highway program is in a fair way to be started.

NEW YORK

A device perfected by C. L. Shaw, superintendent of the Lehigh Coal Sales Co., Buffalo, promises to put the small sizes of anthracite into the regular consumer's bin. It consists of a chain, simuar in appearance to an automobile wheel chain, intertwined between the teeth of an ordinary triangular furnace grate, which keeps the fine coal from running through the grate. The grates can be operated as usual. A blower and thermostat complete the arrangement and enable any furnace to reduce the cost of coal about $5 a ton.

All retiring directors of the Maryland Coal Co. were re-elected at the annual meeting of stockholders April 21. At the organization meeting of directors all officers were re-elected.

Public offering was made April 30 at par of $5,000,000 West Kentucky Coal Co. first mortgage 7 per cent sinking fund gold bonds, Series A, due 1944. The coal company is controlled by the North American Co. The equity over and above the bonds, according to the bankers, is represented by $6,000,000 of preferred stock and $7,000,000 of common, the North American Co. having a cash investment in the equity amounting to more than $6,000,000. The bonds will be secured by a first mortgage on properties appraised in excess of $11,800,000. A sinking fund of 10c. per ton of coal mined will be used for retirement, the minimum sinking fund requirement being sufficient to retire the entire issue in equal annual instalments by maturity. Net earnings for the six years ended with 1923 averaged $1,762,438 annually, which is equivalent to about three times the combined interest and minimum sinking fund charges on this issue.



J. C. Baker

One of the pioneer mine managers of the Winding Gulf District who has lately become identified with the Newport News Coal Exchange as a field representative in the New River field. He will have his headquarters at Beckley.

Royal C. Gillespie, formerly with the Eastern Coal & Export Corporation, became associated with the Independent Coal Corporation, New York City, as director, and George H. Pendleton, as assistant to the president, effective May 1.

J. Fred Morlock has taken the Buffalo agency of the Akron Coal Co. of Akron, Ohio, and of the Sunday Creek Coal Co., of Columbus.

Dr. W. S. Blaisdell of Punxsutawney, Pa., who is extensively engaged in bituminous mining in that section, being connected with the Harry Yates interests of Buffalo, has been nominated as the Republican candidate for the Pennsylvania State Senate against heavy opposition.

OHIO

W. J. McFarland has been elected president of the National Coal Co., with mines in the Guernsey and Eastern Ohio fields, succeeding Harry F. Loomis, of Cleveland, who died April 13. Mr. Loomis was president and general manager and Mr. McFarland, who was treasurer, assumes part of his duties, while George J. Kelly, Cambridge, who was general superintendent, succeeds to the general managership.

Lee Llewellyn has been appointed general manager of the Houston Coal Co., Cincinnati, succeeding the late Kuper Hood. Mr. Llewellyn has been connected with Heyl & Patterson and the Pittsburgh Coal Washer Co. for the last twenty years and is regarded as an authority on the preparation and cleaning of coal for the market.

The Southeastern Coal Co., Cincinnati, which was started a little over three years ago by Robert S. Magee and E. L. Moses and has seen various changes in its personnel since that time, liquidated in Cincinnati on May 1. Last fall Mr. Magee, who was president of the Cincinnati Coal Exchange, was forced to go to California for his health and sold out his holdings at that time.

Tow Dew, who was vice-president of the Western Coal Co., Cincinnati, is now connected with the Humphrey Coal Co., of which he has been the secretary since the company was formed.

Walter D. Bledsoe & Co., Cincinnati, have opened a new mine at Martin, where the Elkhorn seam is being tapped. Officials from the Chicago, Indianapolis and Cincinnati offices recently made a trip of inspection.

PENNSYLVANIA

The Bear Ridge Coal Co., operating mines near Frackville and in whose success many Hazleton investors are interested, has started a safety campaign. Signs, "Examine Your Working Place First," are being posted throughout the workings.

The John Mitchell memorial, on the court house square at Scranton, was completed last week and will be formally dedicated May 30, when it is expected that 50,000 miners will parade and addresses will be delivered by labor leaders from all sections of the country. Peter B. Sheridan, of Hazleton, designed the monument.

Officials of District 1, United Mine Workers, are making efforts to avert a threatened outlaw strike of 20,000 Hudson Coal Co. mine workers in the Lackawanna and Wyoming Valley field. The threat of a general strike is made by members of the general grievance committee, who claim grievances are not receiving proper attention.

An explosion of dynamite recently blew up a big tool box at the new No. 6 slope of the Harwood Coal Co., which is being driven from the surface below the baseball grounds in Harwood to reach underlying seams that cannot be located through the operation of other slopes. Ten sticks of dynamite connected by a fuse were found at the mouth of the workings.

Seven miners were saved after a brief entombment May 1 and a total of 107 escaped without injury when fire broke out in the Lee mine of the West End Coal Co., at Mocanaqua. The blaze started in the 240 ft. level. One hundred men in other parts of the mine were taken out the main entry, but seven were caught behind the fire, and the roof caved in, blocking their escape. William Talbot, a foreman, led the men through an abandoned working to the 330 ft. level and then through old workings to the surface. The fire was extinguished after a two-hour fight in the smoke-filled workings, the fan having been stopped when the blaze was discovered.

An opinion by Deputy Attorney General Philip S. Moyer of Pennsylvania, given to Joseph J. Walsh, Secretary of Mines, holds that a bituminous-coal inspector who resigns from office is not entitled to have his name on the eligible list of inspectors on file in the State Department of Mines, and that before he can be reappointed as a coal inspector he must be re-examined in the manner prescribed by law.

Removal of the burning culm bank at the Pennsylvania colliery in Shamokin is progressing rapidly. A big steam shovel is removing the coal refuse between the burned and unburned sections in the hope of keeping the fire from spreading and perhaps igniting one of the near surface veins underlying the bank. The operations are under the supervision of William B. Geise, division engineer of the Susquehanna Collieries Co. The steam shovel will be kept in operation all summer.

Rinaldo Cappellini, president of District No. 1, United Mine Workers, censured employees of the Woodward colliery of the Glen Alden Coal Co., at Edwardsville for calling and maintaining an unauthorized and illegal strike at the workings for five days. The men quit when the president of the local was discharged. The district union president succeeded in having the strike declared off.

James F. Gildea, a prominent mining man, of Plains, Luzerne County, is acting temporarily on the mine examining board until the Luzerne County Court names a man to succeed the late Patrick McGuire, who was killed by an explosion in the Hazleton shaft operations six weeks ago.

UTAH

Utah mines produced 259,585 tons of coal in March, compared with 339,801 in March of last year and 527,606 in March of 1920.

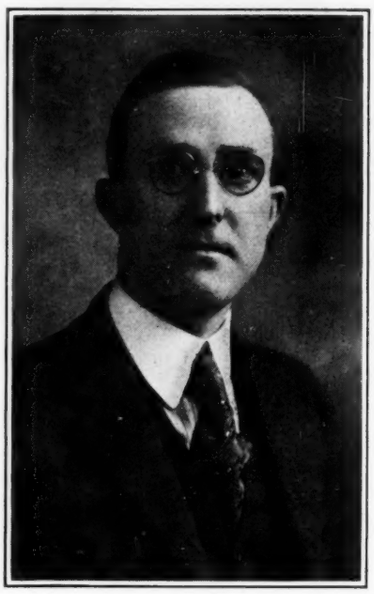
R. M. Magraw, general superintendent of the U. S. Fuel Co. of Salt Lake City, underwent an operation for appendicitis at the Hiawath Hospital last week. His condition is serious. The operation was of an emergency nature.

H. E. Munn, in charge of one of the U. S. Bureau of Mines rescue cars, has become associated with the Utah Copper Co. as coal supervisor.

The new mine of the Black Diamond Fuel Co., at Clear Creek, has reached the productive stage and coal is now being shipped to Salt Lake City. It is asserted that the coal property of this concern contains 52,000,000 tons of coal. This is one of the new mutual companies.

The final reports on the Castlegate explosion of March 8 show that 171 men lost their lives. Earlier reports set the loss of life at 173.

It is stated that more than half a million dollars will be expended this year in development of Utah coal properties. This estimate is made as a result of leasing activities at the U. S. Land office in Salt Lake City.



R. R. McFall

Who has relinquished the management of the Southern Fuel Co. of Morgantown to become vice-president and general manager of the Universal Fuel Co. of Pittsburgh, Pa.

WEST VIRGINIA

The Gauley Power Co. is planning the construction of two power projects on Gauley River and three on Medow River, near Gauley and Kanawha Falls, to develop power to operate coal mines which the company is opening up on these rivers.

The La-Go Pocahontas Coal Co. is preparing to begin operations in the near future near Iaeger, the necessary authority having been granted for the installation of a siding. Finishing touches are being put on a large tipple and entries have been driven, so that little remains to be done before the company begins operations. Officers of this concern are H. H. Liggett, of Cincinnati, president; George H. Wise, secretary and treasurer, and C. L. Gaujot, vice-president and general manager. The La-Go company has 1,100 acres under lease and will be able to produce from 600 to 800 tons a day at normal capacity.

L. E. Wood, president of the Central Pocahontas Coal Co., has announced his candidacy for the nomination for the State Senate in the Sixth Senatorial district of West Virginia.

Dan R. Lawson, formerly located at Fairmont, is now connected with the Philadelphia office of W. A. Marshall & Co., wholesale coal dealers.

The Arlington Coal & Coke Co., of which Morris Watts of Bluefield is general manager, put a new tipple in commission at the Arlington mine last week. This tipple is equipped with modern shaker screens and other equipment for the complete preparation of coal. This makes the third mine recently opened in the same group of interests, the Premier Pocahontas Coal Co. having put up a new tipple a few weeks ago at Premier. A few months ago work was completed for the Gillam Coal & Coke Co.

According to a compilation made by the Pocahontas Operators Assciation 390,010,346 net tons of coal have been mined in the Mercer and McDowell County fields and approximately 4,287,931,640 net tons remain.

The Weyanoke Coal & Coke Co., of Widemouth, in the Pocahontas field, has just completed work on a new fan for the mine and arrangements are being made to install additional electrical equipment and to re-equip the mine in that respect.

The Coe Pocahontas Coal Co., of McComas, is formulating plans to increase the productive capacity of its mines. The capital stock of the company will be increased from $200,000 to $300,000 to finance the project.

CANADA

G. M. Campbell, who has resigned as manager of the Cassidy Collieries, Granby Consolidated Mining, Smelting & Power Co., Ltd., Vancouver Island, was the guest of honor at a banquet March 28, at Nanaimo, B. C., given by the Vancouver Island Branch of the Canadian Institute of Mining & Metallurgy. Charles Graham, of Cumberland, district superintendent of the Canadian Collieries (D) Ltd., was chairman. Nichol Thompson, of Vancouver; T. A. Spruston, of Ladysmith; (Canadian Collieries); John Hunt, Nanaimo, Western Fuel Corporation of Canada; V. Quinn, of Vancouver, Granby Consolidated Co., and J. W. Jenson, Lantzville, Nanoose-Wellington Collieries, who made addresses, expressed regret over Vancouver's loss in the departure of a man of Mr. Campbell's outstanding ability.

A new company headed by A. J. Tonge, former general manager of the Dominion Coal Co., propose to **expend $7,000,000 in the development of the Inverness County coal fields,** North Cape Breton, and to control the areas at Mabou, Chimney Corner and Craigness. This development will include the building of a modern town on the banks of the North East River at Cape Mabou, the dredging of Mabou Harbor, the building of a large breakwater, and the putting into commission of a fleet of steamers for the St. Lawrence River trade. The new company intends to compete with the British Empire Steel Corporation for control of the St. Lawrence River business. The deposits of the Inverness basin are estimated at 900,000,000 tons of varying quality suited to any purpose for which bituminous coal can be used.

Traffic News

Through Rate on Virginian to Deepwater Recommended

According to an announcement from Washington, the examining commissioner of the Interstate Commerce Commission has reported favorably upon the petition of certain shippers on the Virginian lines that all-rail through freight rates be established by the Virginian to Deepwater, W. Va.

More than a year ago Major W. P. Tams, Jr., president of the Gulf Smokeless Coal Co., of Tams, W. Va., together with several other operators in the Winding Gulf district, filed a petition with the I. C. C. that the Virginian Ry. be forced to give all-rail through freight rates on coal west so as to relieve the congestion of Virginian coal tonnage at tidewater ports.

The Virginian objected to this request on the ground of a limited number of coal cars and if forced to ship west the road's equipment would be off its rails beyond its control and would be months getting back into the field. Advices from Washington carry the information that the Virginian Ry. will have until May 20 to file objections and argue before the full membership of the commission. It is felt that the Virginian Ry. will continue active objections and that it will take the final decision of the full membership of the I. C. C. to settle the question.

I. C. C. Issues Rate Rulings

Proposed increases in rates on bituminous coal from Green Bay group points in Wisconsin to various destinations have been found by the Interstate Commerce Commission not to be justified.

Certain increases and certain reductions in rates on coal from points in Illinois and Indiana and from St. Louis to various destinations on the Great Northern in Iowa, Minnesota, North Dakota and South Dakota have been found justified.

Rates on coal and coke from Pittsburgh, Connellsville and Reynoldsville to Buffalo are not unreasonable, the commission has found. The relationship between ore and coal rates from lower Lake Erie ports to certain interior points does not result in undue preference or prejudice, the commission has found.

Great Western Disturbs Northwest

Just what the outcome will be of the lower rates on coal from western Kentucky to southeastern Minnesota points via the L. & N. and the C. G. W. remain to be seen. They meet and in some cases cut the low rates made to points on the M. & St. L. Whether this will start something generally remains to be seen. The immediate effect will be to divert some business from southern Illinois to western Kentucky and to cut into the tonnage of eastern Kentucky coal moved off the docks into this district. But if there is not a move in retaliation, it will be strange, and this may start something quite generally in coal freights, unless it is hindered by some move by the Interstate Commerce Commission. The latter has the subject before it and may not allow the rates to continue, something that seems quite likely in view of the commission's predilection toward averting any serious consideration of the entire subject.

Lignite Rate Hearing Resumed

The hearing on the proposed higher rates on lignite in North Dakota has been resumed at Bismarck, N. D. Representatives from the state railroad and warehouse commissions of South Dakota, Minnesota and North Dakota have presented opposing testimony, indicating the changes would cause increased fuel costs to their respective states. It was estimated that the state institutions of North Dakota, which all burn lignite, would have to pay $40,000 more a year on coal freight under the proposed rates.

Coming Meetings

National Exposition of Coal Mining Equipment and Machinery of the American Mining Congress, May 12-17, Cincinnati, in conjunction with the annual meeting of the National Coal Association.

West Virginia Coal Association. Annual meeting May 13-17, Cincinnati, Ohio. Secretary, W. H. Cunningham, First National Bank Building, Huntington, W. Va.

National Coal Association. Annual meeting, May 14-16, Cincinnati, Ohio. Executive Secretary, H. L. Gandy, Southern Building, Washington, D. C.

Mine Inspectors Institute of America. Annual meeeting, Sinton Hotel, Cincinnati, Ohio, May 14-16. Secreetary, Martin Bolt, State House, Springfield.

Retail Coal Dealers Association of Texas. Nineteenth annual convention, May 20 and 21, Vernon, Texas. Secretary, C. R. Goldman, Dallas, Texas.

Pennsylvania Retail Coal Merchants Association. Twentieth annual meeting and exposition, Commercial Museum, 34th and Spruce Sts., Philadelphia, Pa., May 22-23. Secretary, W. M. Bertolet, Reading, Pa.

International Railway Fuel Association. Sixteenth annual convention, May 26-29, Chicago, Ill. Secretary-Treasurer, J. B. Hutchinson, 600 Michigan Ave., Chicago, Ill.

The American Society of Mechanical Engineers. Spring meeting May 26-29, Cleveland, Ohio. Secretary, Calvin W. Rice, 29 West 39th St., New York City.

American Wholesale Coal Association. Annual convention, White Sulphur Springs, W. Va., June 3-4. Secretary, G. H. Merryweather, Chicago Temple Bldg., Chicago, Ill.

West Virginia Coal Mining Institute. Annual meeting June 3 and 4, Elkins, W. Va. Secretary, R. E. Sherwood, Box 1026, Charleston, W. Va.

The National Foreign Trade Convention. June 4-6, Boston, Mass. Secretary, O. K. Davis, 1 Hanover Square, New York City.

National Retail Coal Merchants' Association. Annual meeting, Hotel Virginian, Bluefield, W. Va., June 4-6. Secretary, Walter D. Rogers, Transportation Building, Washington, D. C.

Southwestern Interstate Coal Operators Association. Annual meeting June 10, Kansas City, Mo. General Commissioner, W. L. A. Johnson, Keith & Perry Bldg., Kansas City, Mo.

Illinois & Wisconsin Retail Coal Dealers Association. Annual meeting, June 10-12, Delavan, Wis. Secretary, I. L. Runyan, Great Northern Bldg., Chicago, Ill.

Illinois Mining Institute. Annual meeting, June 12-14 from St. Louis via boat down the river. Secretary, Martin Bolt, Springfield, Ill.

American Society for Testing Materials. Annual meeting, Chalfonte Hotel, Atlantic City, N. J., June 23-27. Secretary, Edgar Marburg, University of Pennsylvania, Philadelphia, Pa.

New Equipment

Improved Lubricating System For Rod Bearings

The Alemite lubricating system, developed by the Bassick Manufacturing Co., Chicago, recently has been adapted to the lubrication of rod bearings. Briefly, the system consists of a large Alemite grease gun which can be quickly applied, without threading, over the end of a nipple, the latter taking the place of the ordinary rod grease-cup plug or cap. These nipples are turned into the grease cups and spot-welded in place so that they cannot work out or be lost, thus saving a considerable item of expense in ordinary operation. This loss is well worth while avoiding, both because of the cost of the caps and, because, and perhaps this is more serious consideration, the loss of a cap gives dirt or grit an opportunity to get into the grease.

The way in which the gun fits over the end of the nipple can be seen in the illustration, as also the powerful gearing arrangement for forcing hard grease through the ¼-in. hole into the grease cup. Pressures up to 2,500 lb. per sq. in. are said to be obtained by turning the long handle which moves the piston through a threaded spindle and gearing arrangement. Friction on the large gear is greatly reduced by means of a ball thrust bearing. The leather and spring in the end of the gun are so designed as to take care of slight irregularities in the nipple ends and to prevent the leakage of grease when the gun is first applied. After

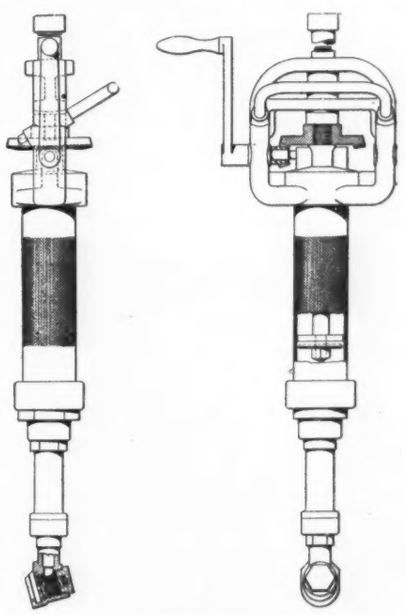


Fig. 1—High-Pressure Grease Gun

A special attachment on the end of the gun prevents any grease from leaking from the fitting. With little effort on the part of the workman 2,500 lb. pressure can be generated to force the grease into the bearing.

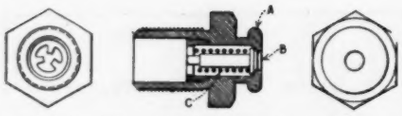


Fig. 2—New Nipple Replaces Cap

The shoulder *A* holds the gun fitting without the necessity of any threading; valve *B* excludes dirt or other foreign matter. Spring *C* closes the valve as soon as the pressure of the grease gun is relieved.

pressure is developed in the gun, the leather is held against the nipple with a heavy pressure, and no grease can be forced out except to the grease cup.

Referring to the illustration of the nipple, *A* is the shoulder over which the grease gun fitting is applied. The valve *B* and spring are so arranged that hard grease can enter the nipple, but as soon as the pressure is relieved the valve will seat and prevent the entrance of dirt or other foreign matter.

Probably the outstanding advantage of the system is in the better lubrication which it provides. With reasonable care in filling the gun, clean grease can be applied to rod bearings with no danger of cinders, dust and dirt entering with it as too often happens with present methods. Men assigned to the duty of filling rod grease cups do not always realize the importance of keeping the grease clean and even with the best of intentions under present methods the cylindrical sticks of grease often contain dirt picked up when they are laid on the floor or ground. This newly developed device is designed to prevent foreign matter getting into the grease and eventually to the bearings. It therefore tends to improve the efficiency of rod lubrication and prevent cut and hot bearings.

With the device, the grease cups are said to be filled more quickly than by the usual methods. The grease-gun fitting is simply applied over the end of the nipple and a few turns of the handle will do the work, whereas the older method requires that the plug or cap be threaded into and out of the grease cup possible several times before sufficient grease can be forced in to fill the cup.

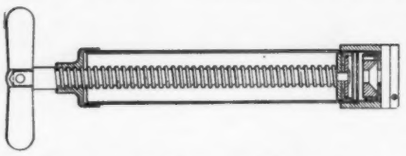
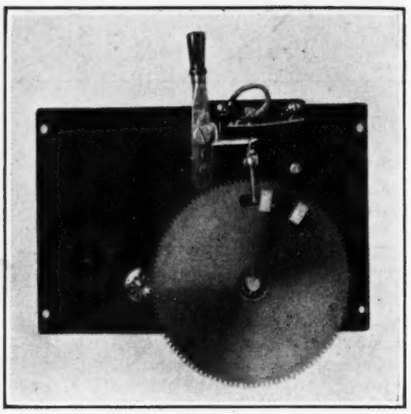


Fig. 3—Auxiliary Portable Gun

Whenever the lubricating system is applied to locomotives or other portable machinery, the engineman carries this gun with him while on the road.

An important safety feature is that should a rod bearing become hot, grease can still be forced into it with the grease gun without the workman being in danger of being scalded with boiling grease. Men are often seriously burned when, in applying grease to a hot bearing, they attempt to thread the plug or cap back into the cup by hand.



Automatic Switch Prevents Overwind

With little expense and labor this little device can be applied as an extra precaution against possible injury to hoisting equipment or men.

adjustment for any particular hoist. For larger hoists the same protective features can be obtained by changes.

Pressure Control Relay

A new pressure governor to be used in conjunction with magnetic starting panels in the control of motor-driven pumps and air compressors, has been developed by the General Electric Co.

The governor can be set for a maximum and minimum range of air or water pressure. An auxiliary relay may be provided which will open the circuit of a control panel when maximum pressure is reached and close it when the pressure drops to the lower limit. The electrical connections are arranged so that the governor merely closes its contacts and is never subjected to heavy currents and arcs such as develop when circuits are broken.

The contact tips are silver-plated to give low contact resistance and eliminate burning and sticking. The device is enclosed in a cast-iron box with a glass window through which the indicating dial is visible. The complete unit is designed for mounting on a wall. It is approximately 10 in. square and 4 in. deep.

Relay Maintains Pressure in Pipes

High- and low-limit contacts by their action hold the air or liquid pressure within predetermined values.

Automatic Limit Switch

An improved device, known as the Ross limit switch, has been placed on the market by the Roberts & Schaefer Co., Chicago, Ill. This small device has been designed for use on electric hoists, using magnetic brakes. It is claimed that it is so connected that it will positively prevent the overwinding of any electrically driven hoist, in the event of failure of any or all of the other control apparatus. It is wired merely between the terminals on the electric control board, and the solenoid-operated brake. Should the drum of the hoist overtravel, the spring switch automatically functions, breaking the current and setting the brake.

Any electrically operated drum hoist can be quickly protected with one of these switches, it being necessary only to tap a $\frac{5}{16}$-in. hole for the drive pin in the end of the drum shaft.

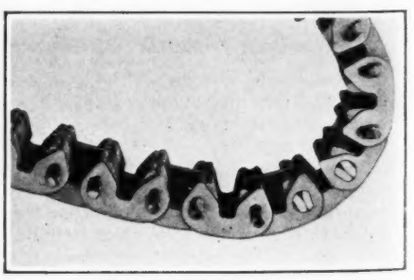
The switch is designed for an average travel of 128 ft., vertical lift, using a 36-in. drum, but may be applied to any hoist having a shorter lift. Provisions have been made to vary the

Compensated Silent Chain

A simple silent chain possessing many new features has recently been placed on the market by the Ramsey Chain Co., Inc., 1031 Broadway, Albany, N. Y. The section of chain shown in the illustration has had one outside link removed, to show the ends of the pins at the joint.

This joint has a compensating effect when the chain is flexed around a sprocket of comparatively small diameter. It will be noted that the profile of all the pins is the same, producing a symmetrical joint and allowing the chain to run in either direction.

One pin of each pair is carried through the outside links in which it is a drive fit and is spun over after assembly. This method holds the pin in proper relation with the chain at all times. The individual links also are symmetrical, and the simple contour of the holes for the pins facilitates accurate construction of the links. As the relative motion of the pins is rolling, there is no tendency of the faces to slip and groove as they wear, a condition which is also helped by the small angle between the pin faces throughout their action. This chain is now being made in standard pitches from $\frac{3}{8}$ to 1 in. inclusive, and will no doubt be found serviceable for fan drives and coal preparation machinery.



Flexible Steel Chain

As this chain meshes with a sprocket of small diameter, there is a slight increase of the pitch. This compensates for the sudden acceleration impulse which ordinarily strains a chain.